SOAH DOCKET 582-07-2673
TCEQ DOCKET NO. 2007-0204-WDW

APPLICATION OF TEXCOM GULF DISPOSAL, LLC, FOR TEXAS COMMISSION ON ENVIRONMENTAL QUALITY UNDERGROUND INJECTION CONTROL PERMIT NOS. WDW410, WDW411, WDW412 AND WDW413	)	STATE OFFICE OF ADMINISTRATIVE HEARINGS

SOAH DOCKET NO. 582-07-2674
TCEQ DOCKET NO. 2007-0362-IHW

APPLICATION OF TEXCOM GULF DISPOSAL, LLC, FOR TEXAS COMMISSION ON ENVIRONMENTAL QUALITY INDUSTRIAL SOLID WASTE PERMIT NO. 87758	)	STATE OFFICE OF ADMINISTRATIVE HEARINGS

REMANDED HEARING ON THE MERITS
MONDAY, JUNE 21, 2010

BE IT REMEMBERED THAT at 8:01 a.m., on Monday, the 21st day of June 2010, the above-entitled matter came on for hearing at the State Office of Administrative Hearings, William P. Clements, Jr., Building, 300 West 15th Street, Room 404, Austin, Texas, before THOMAS H. WALSTON AND CATHERINE C. EGAN, ADMINISTRATIVE LAW JUDGES, and the following proceedings were reported by Lorrie A. Schnoor and Rebecca Callow, Certified Shorthand Reporters of:

Volume 5 Pages 839 - 1068

840

P R O C E E D I N G S
MONDAY, JUNE 21, 2010
(8:01 a.m.)
(Exhibits Individual Protestant Nos. D, 25, 25A, 26 through 28 marked)
JUDGE WALSTON: We'll go back on the record. This is the continuation of the hearing in Docket Nos. 582-07-2673 and 582-07-2674 concerning TexCom Gulf Disposal. The Individual Protestants representing their case.
And I assume this is Mr. Smith?
MR. FORSBERG: Yes, Your Honor.
JUDGE WALSTON: Okay. Do we have any preliminary matters we need to take up before we --
MR. RILEY: I think we do, Judge.
I'm sorry.
As you entered, you probably heard me exchange some words with Ms. Mendoza. There has been a repeated course of conduct in this case that I'm about to complain about. It is: Literally this morning, Ms. Mendoza approached me -- it was just after 8:00 -- and asked me to confer on a motion. I don't even know what motion Ms. Mendoza is referring to, and then she handed me a ream of paper. And it makes me appear as though I'm uncooperative or behaving in an

841

unprofessional way, but I simply don't have any idea what Ms. Mendoza is talking about. She continues to do this just moments before we convene a session.
So I'm asking you, Judge, I don't know what Ms. Mendoza has planned for us by way of another motion, but I wanted you to be aware of the facts and the exchange -- the circumstances around the exchange you just heard.
JUDGE WALSTON: Okay.
MS. MENDOZA: Your Honor, I was going to in no way say anything about the conduct that occurred when I tried to confer. We do plan to present a motion. I'm going to amend my Certificate of Conference, and we had put in our original file about the notice issues that we wanted to present evidence on notice. We were trying and attempting to confer with TexCom after having conferred with all the other parties this morning about whether they objected to us submitting that kind of evidence as a part of our direct case today. We'll be making a motion about that, and that's what we were attempting to confer on.
JUDGE WALSTON: Okay. All right. Well, then, let's go ahead and proceed.
Mr. Smith, will you raise your right hand.
(Witness sworn)

842

JUDGE WALSTON: Okay. Would you go ahead and state your full name for the record.
WITNESS SMITH: It's John Robert Smith, and I'm commonly known as "Bob."
JUDGE WALSTON: Okay. Thank you, Mr. Smith.
Mr. Forsberg, you can proceed.
MR. FORSBERG: Yes, Your Honors, before -- I just wanted to make a clarification in his testimony, that there was some discussion about -- at the prehearing conference with regards to exhibit numbers. On Page 3 of his testimony, Line 15, there's a reference to Exhibit 25. There's actually two 25's identified, so I -- we changed that to Exhibit 25A.
JUDGE WALSTON: The one referred on this page?
MR. FORSBERG: Yes.
JUDGE WALSTON: Okay.
MR. FORSBERG: Yes.
JUDGE WALSTON: Okay. And then below, where it says, "offer Exhibit 25," should that be "offer Exhibit 25A"?
MR. FORSBERG: Yes, Your Honor.
JUDGE WALSTON: Thank you.

843

PRESENTATION ON BEHALF OF
INDIVIDUAL PROTESTANTS (CONTINUED)
JOHN ROBERT SMITH,
having been first duly sworn, testified as follows:
DIRECT EXAMINATION
BY MR. FORSBERG:
Q Good morning, Mr. Smith.
A Good morning.
Q In front of you, do you have a booklet titled, "Individual Protestants Exhibit D"?
A Yes, I do.
Q And within that booklet, do you find Direct Testimony of John R. "Bob" Smith?
A Yes, I do.
Q And do you recognize that testimony?
A Yes.
Q Is that testimony you gave?
A Yes.
Q Attached to it are also some exhibits -- excuse me. It's early in the morning, so my words are getting jumbled.
But Exhibits 25 through -- 25, 25A, 26, and 27 and 28. Do you see those exhibits?
A Yes, I do.
Q And are those true and correct copies of

844

exhibits that you created in your work in this case or reviewed in your work in this case?
A Yes, they are.
Q Do you have any changes you'd like to make to your prefiled direct testimony?
A No, I don't.
Q Are your answers to the questions posed in Exhibit D the same on -- in Exhibit D as they would be if I asked you the questions live today?
A Yes, they are.
MR. FORSBERG: With that, Your Honors, I would offer Exhibit D, Individual Protestants Exhibit D, and Exhibits 25, 25A, 26, 27, and 28 into evidence.
JUDGE WALSTON: Those exhibits are admitted.
(Exhibits Individual Protestant Nos. D, 25, 25A, 26 through 28 admitted)
MR. FORSBERG: And with that, Your Honor, I would pass the witness.
JUDGE WALSTON: Okay. Does Lone Star have any cross-examination of Mr. Smith?
MR. HILL: No questions, Your Honor.
JUDGE WALSTON: Does Denbury have any cross-examination?
MR. SENCENBAUGH: No questions, Your

845

Honor.
JUDGE WALSTON: Aligned Protestants?
MR. WALKER: No questions, Your Honor.
JUDGE WALSTON: Public Interest Counsel?
MR. McWHERTER: No questions.
JUDGE WALSTON: Executive -- excuse me -- TexCom.
MR. MOORE: We have a few, Your Honor.

CROSS-EXAMINATION

BY MR. MOORE:
Q Good morning, Mr. Smith.
A Good morning.
Q If you would, do you still have your prefiled testimony there in front of you?
A Yes.
Q If you would, please turn to Page 2 of that testimony. I believe it's labeled 2 of 7. I'm going to direct your attention down to the very bottom of that page. It starts on Line 49.
And there you note that in TexCom's application, TexCom has included all of the Cockfield Formation as the, quote, injection zone. Correct?
A That's correct.
Q Okay. And do you know what the difference is between the injection zone and the injection interval as

846

it's specified in TexCom's application?
A Over the course of this hearing, I believe I've got a clear definition. At the time I wrote that, it was probably less clear because I don't know what the intent of TexCom was. But I think they've clarified that better.
Q Okay. And if you would, please tell the Judge what your understanding is now of the difference between the injection zone and the injection interval.
A The injection interval is the perforations that's basically in the lower Cockfield, whereas the injection interval is all of the Cockfield Formation, is the way I understand it.
Q I think you might have just misspoke there, so I want to make sure that the record's clean.
A Did I turn it around?
Q Well, I think you said injection interval twice.
A Okay.
Q So the injection interval is where the perforations are. Correct?
A Right.
Q And that's only in the lower Cockfield?
A Right.
Q And then the injection zone includes the entire

847

Cockfield?
A That's correct.
Q Okay. And your counsel and you went through some explanations of the exhibit numbering and changes. If you would, please turn to Exhibit 25A that's attached to your prefiled testimony. And although the pages aren't numbered, I want to direct your attention to the second page entitled, "TexCom Injection Well P-110 Casing Concerns."
A (Witness complies.)
Q Okay. On this diagram, what I'll call the left-hand column there, down towards the very bottom of the page, you have a -- an area labeled "injection zone." Correct?
A Yes.
Q Okay. And above that, you have the Conroe oil sand. Correct?
A Yes.
Q And then above that, you have the upper Cockfield sands. Correct?
A Right.
Q Based upon what you now understand to be the difference between the injection interval and the injection zone, would it be correct to revise what you've labeled here as the "injection zone" to read

848

"injection interval"?
A Yes, it would be.
Q Do you have a pen up there with you? If you'll make that correction on Exhibit 25A of the record copy.
A Just change "zone" to "interval"?
Q That's correct.
A (Witness complying.)
Q Okay. Let's go back to your prefiled testimony, that is the Q and A. And I'd like to turn to Page 3 of that testimony.
Here, beginning on Line 17 and taking up a good portion of this page, you note a concern that you have regarding your opinion that trace amounts of H2S will be encountered in the waste streams that TexCom proposed to receive. Correct?
A That's correct.
Q Okay. And for the benefit of everyone, what is the -- what is H2S?
A H2S is hydrogen sulfide, but it generates from organic matter, mainly. So it doesn't take much organic matter in your waste stream to generate some H2S, and it's sometimes called sewer gas even.
Q Okay. And so is it your opinion that any waste stream with organic matter in it is going to generate H2S?

849

A In the quantities that TexCom is proposing to be injecting, I don't see how that they would not encounter some H2S in the course of operating this disposal well.
Q Okay. And is that with respect to every waste stream or only select waste streams?
A I would say that it would not pertain to some waste streams but to a lot of waste streams.
Q And you're worried -- your concern here is that the casing may be corroded by the H2S. Is that fair?
A P-110, as most people understand, that's -- or that's a grade of casing that's not acceptable for use in H2S environments. And a lot of it has to do with temperature, and you're a fairly cold environment, particularly injecting fluids, so the temperature is going to be low.
And H2S causes a phenomena called stress corrosion cracking. It's not a corrosion that causes -- like oxygen corrosion, which ends up in a -- eroding a hole over a period of time. Stress corrosion cracking is catastrophic. The whole pipe will fall in two. So when you have a failure due to stress corrosion cracking or hydrogen sulfide failure, it's very abrupt, and the whole tubular will open up. So it's a big conduit; it's a big leak.

850

Q Have you reviewed TexCom's applications?
A Yes, I have.
Q Okay. Cover to cover?
A Yes.
Q Okay. And are you familiar, then, with the provisions in the application for testing of the waste streams that come in for compatibility with the well materials?
A Yes, I have.
MR. MOORE: No further questions, Your Honor.
JUDGE WALSTON: Okay. Executive Director have any questions?
MS. GOSS: No questions.
JUDGE WALSTON: Mr. Forsberg, do you have any redirect?
MR. FORSBERG: Just briefly, Your Honor.
REDIRECT EXAMINATION
BY MR. FORSBERG:
Q Mr. Smith, you were just asked a question about the testing procedures of the waste streams coming in. Do you recall that?
A Yes.
Q Do the testing procedures as set forth in the application, does that satisfy your concerns with

851

regards to corrosion?
A Well, I think that TexCom will face two issues even though they tested the materials that they're using. These corrosion issues generate in situ, if you will, and you've got two concerns. One is the generation of H2S. The other one is oxygen corrosion, and both of them are quite real in these applications. So not only did -- the P-110 is inadequate, but over life, their L-80 tubing string will be subject -- it's all right for H2S, but it will be subject to oxygen corrosion.
And my thought was if you're trying to use best technology, best practices, you would have had more corrosion resistant materials in these wells. So it was apparent to me that the TexCom well is, you know, kind of designed on the cheap side. It was really designed in 1999, I understand, and so it wasn't really a design for a Class I waste injection well.
Q Do you have knowledge of where the packer is located on Well 410?
A Yes, I do.
Q Do you believe that any of the corrosion that we've been talking about could occur below the packer?
A That's my concern about the stress corrosion cracking, the H2S corrosion. That packer is set quite a

852

bit high to the lowest perforations, and it -- also, behind that casing, well, you have the upper and the middle Cockfield exposed. So if that packer was set lower, well, you could eliminate that particular hazard.

MR. FORSBERG: No further questions. Thank you.

JUDGE WALSTON: Lone Star?

MR. HILL: No questions, Your Honor.

JUDGE WALSTON: Denbury?

MR. SENCENBAUGH: No questions, Your Honor.

JUDGE WALSTON: Aligned Protestants?

MR. WALKER: No questions, Your Honor.

JUDGE WALSTON: Public Interest Counsel?

MR. McWHERTER: No questions.

JUDGE WALSTON: TexCom?

MR. MOORE: I think one question, Your Honor.

RECROSS-EXAMINATION

BY MR. MOORE:

Q Mr. Smith, just so we're all clear, as far as the concerns you've expressed in your prefiled testimony and here today, those concerns concern only Well WDW410. Correct?

A That's correct.

853

MR. MOORE: No further questions, Your Honor.

JUDGE WALSTON: Anything from the --

MS. GOSS: No questions.

JUDGE WALSTON: Anything else, Mr. Forsberg?

Okay. Thank you, Mr. Smith, very much.

JUDGE WALSTON: Mr. Forsberg, if I understood from our conversation Friday, you've withdrawn the testimony of Martha Bent?

MR. FORSBERG: Yes, Your Honor.

JUDGE WALSTON: Okay. So does this conclude the case of the Individual Protestants?

MR. FORSBERG: Individual Protestants are concluded, Your Honor.

JUDGE WALSTON: Thank you.

If I understand correctly, Denbury is going to begin with Mr. Herber?

MS. MENDOZA: That is correct, Your Honor.

JUDGE WALSTON: Okay.

MS. MENDOZA: I have one matter that I was hoping that I could get some agreement from the parties on. Exhibit 17 to Mr. Herber's testimony is a geomap. I believe that that could be subject to a license agreement, and I would like to ask the indulgence of the

854

parties to, perhaps, treat that as confidential. And if I could replace -- or give each of them an envelope to treat that as confidential and subject to the protective order that's in this case, I would appreciate each party's cooperation on that.

JUDGE WALSTON: Is there any objection?

MR. RILEY: None.

JUDGE WALSTON: There being no objections, that would be fine. That was Exhibit 17?

MS. MENDOZA: It's Exhibit 17, yes.

MR. RILEY: The first --

MS. MENDOZA: I appreciate everyone's cooperation. I apologize for the error.

MR. RILEY: Judge, obviously, it's only at this time that it could be subject to, so we can conduct ourselves from this point forward as though it's subject to the protective order. But what's happened before -- I'm not suggesting there's been a violation prior to this point, but it certainly wouldn't apply before this point.

JUDGE WALSTON: Correct. That will be the understanding.

MR. RILEY: Thank you.

JUDGE WALSTON: From this point forward.

MS. MENDOZA: That is our understanding.

855

I appreciate everyone's cooperation on that.

JUDGE WALSTON: Give me just a second to find Mr. Herber's testimony.

MS. MENDOZA: Mr. Herber's testimony, I believe, begins with Exhibit 13.

JUDGE WALSTON: Will you raise your right hand.

(Witness sworn)

JUDGE WALSTON: Okay. Pull that microphone to you real closely, and state your full name, please.

WITNESS HERBER: Jon Herber.

JUDGE WALSTON: Okay. Thank you, Mr. Herber.

And, Ms. Mendoza, you can proceed.

MS. MENDOZA: Thank you.

PRESENTATION ON BEHALF OF
DENBURY ONSHORE, LLC
JON HERBER,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MS. MENDOZA:

Q Mr. Herber, do you have in front of you a series of exhibits numbered Denbury Exhibit 13 through 17?

856

A Yes.
Q And can you identify what Denbury Exhibits 13 through 17 are?
A My prefiled testimony.
Q Okay. And since the time you prepared those exhibits, have you had the opportunity to review the exhibits for any corrections that need to be made?
A I have.
Q And do you have any corrections to Denbury Exhibits 13 through 17?
A No.
Q Do you adopt Denbury's Exhibits 13 through 17 as your testimony just as though you had given your testimony live here today under oath?
A I do.
MS. MENDOZA: Denbury offers Exhibits Denbury 13 through 17.
JUDGE WALSTON: Exhibits 13 through 17 are admitted.
(Exhibits Denbury Nos. 13 through 17 admitted)
MS. MENDOZA: Denbury passes the witness.
JUDGE WALSTON: Lone Star?
MR. HILL: No questions at this time, Your Honor.

857

JUDGE WALSTON: Individual Protestants?
MR. FORSBERG: No questions at this time.
JUDGE WALSTON: Aligned Protestants?
MR. WALKER: I do have a question or two, Your Honor.
JUDGE WALSTON: Okay.
CROSS-EXAMINATION
BY MR. WALKER:
Q Mr. Herber, are you familiar with the reference -- I guess it would be a unitized oil field?
A Yes, sir.
Q Can you provide the judges here, just briefly, what your understanding is of that reference?
A Usually, in an oil and gas field, the different oil and gas operators enter into an agreement where they have a proposed outline, and within that proposed outline, they agree to share in the production. And the interval is usually bounded by the top and base of the productive interval.
Usually this arrangement is to prevent a waste of oil and gas. To have this done, they have to go before the Railroad Commission with evidence that it would be in the best interest of the state to prevent waste, and it also has to be economic. They make a case before the Railroad Commission and an order is granted

858

and then it becomes effective.
Q Okay. Mr. Herber, do you know if the Conroe field has received such an order designating it as a unitized field?
A In the early '70s, the Conroe Association undertook a study with about 28 company members. Those company members formed a study group, if you will, of about 20 companies. There were six full-time scientists involved with the other 20 -- approximately 20 other part-time participants. They studied the field to make a recommendation for their unitized interval.
During that time, also, the land departments were gathering up evidence -- not evidence -- getting the leases ratified for the possibility of having that unit formed. So all the -- I don't know how many leases it were. Over 200 leases were ratified for the presentation to the Railroad Commission for the possibility of unitization, proposed unitization.
Q Okay.
A And that -- during that five-year time period, both the technical and land part were brought together and presented to the Railroad Commission, and it was approved in 1978.
Q All right. So as we speak today, the Conroe

859

field is a unitized field?
A That is correct.
Q There's been some testimony, I think, just maybe not a whole lot, but some testimony previously in this hearing that there are economic or, perhaps, monetary advantages to an order -- resulting from an order of unitization. Is that true, in your opinion?
When I say "monetary advantages," to the people producing the field.
A Yes. And it's an advantage, also, to the state because all the money. There will be more recovery of oil and gas.
Q Okay.
A The -- in the specific case of the Conroe field, the basic problem there was due to the competitive nature of all the different companies up until that point, there were -- some individuals were producing more gas than their neighbors. That was allowing the oil-gas contact to move, and what that did was caused oil to migrate into the gas cap. That caused waste because the oil was smeared into dead ends. They calculated, roughly, that up and to the point of unitization, there were almost 40 million barrels of oil being wasted because of that -- oil migrated into the gas cap.

860

Q All right.
A So that -- let me finish, sir.
Q I'm sorry.
A So the purpose of that was to stabilize the gas cap by stopping the production of the gas as a group and also to have increased withdrawal of the water at the bottom, so that was the intent. So they pumped the water very hard and stopped producing the gas, and that was their attempt to stabilize the gas cap. Or that was the proposal. That was the reason they proposed to unitize it. And, in fact, within a three-year time period, they did achieve that goal.
Q Okay. Well, thank you, Mr. Herber.
Let me ask you if in addition to waste issues and, I suppose, economic issues, when a determination is made or an order entered unitizing a field, tell me if there are geologic issues that come into play or are offered as information in making a determination to unitize the field.
A There are. And if you can imagine from -- just from this previous testimony, geologists as a group usually are hard to get to agree. So one of the major charges of this unitization process was to gain consensus of what the geologic picture was. So the 20 member companies of the technical subcommittee, which is

861

the more official term, had to come to a geologic consensus as to where the faults were, what the basic geology was, what the sand distribution was.
The other part of this is, they needed to formulate what the original oil in place was because then everybody would be able to -- they had to know what the original oil in place was under each tract so that the resulting persons could get their proportionate share of the combined oil and gas production.
So it was very -- it was a -- it had a two-prong point. One is to have the basic understanding of geology, but the more serious monetary part is to understand how much, if you will, piece of the pie belongs to each of the member companies that were going to join in the unit.
Q All right, sir. Have you yourself studied the geology of the Conroe field and/or reviewed other previous studies of the Conroe field as to its geology?
A I have.
Q Let me ask you: Do you have any understanding, based on your study, as to whether or not the members of the Cockfield Formations, upper, middle, and lower, do you have any understanding or belief as to whether or not they communicate?
A From a review of multiple sources, it's my

862

opinion that the Cockfield is all in communication with each other, and it breathes as one. And the main reason for that belief is the production information. There are other geological information that would make me feel that way, and they're geological study informations.
I think most of the geologists that have spoken here to date believe that we're in a salt tectonic active area, and that by definition means that we have faults and fractures. That's the hallmark of a salt tectonic active area. Those fault and fractures are the basic conduits, if you will, for that communication.
And that was the conclusion of the Railroad Commission in 1933 when a group of operators wanted to separate the upper Cockfield sands from the Conroe sands. So those little stray sands that we've been calling that are above TexCom's topicon (phonetic) of Cockfield, those are what most people call the Cockfield sands. And they wanted to have them with a separate allowable so they could produce at different rates than the Conroe field.
Originally, the Railroad Commission separated them. Then when the other operators showed that they were in communication, they were -- had the same allowable as the rest of the unit. So from 1933

863

on -- and then that was basic thesis of the unitization hearing, was that they're all -- those sands are in communication. Those little sands, by the volumetric estimates that were made for the unitization hearing, produced 160 percent of their volume. In other words, they were -- by Exxon's calculation, were gaining roughly 5 BCF a year through faults and fractures.
The other part of the geological setting is that we're in a fluvial deltaic geological setting. I think everybody agrees to that. That means that there are different geological faces that have different permeabilities, different preferred paths, so it allows the oil and gas to have a tortuous path to the faults and fractures. And they also allow oil and gas to go where you have sand and sand juxtaposition across the faults.
The third path in those studies that I reviewed are the artificial penetrations. There was some discussion in those papers that I read that the artificial penetration could allow some of that vertical communication. Exxon did a temperature -- this is testimony in one of these papers. Exxon did a study and -- with temperature logs. That's a common way to determine channeling. They then found the ones that had channeling, undertook a squeeze program, and the rate

that the gas-oil contact was moving upward didn't appreciably change. So their conclusion was that the artificial penetrations were not the main conduit for that vertical migration. If anything, just a minor problem.

Q All right. Mr. Herber, we've been talking about the Conroe field, and you've given a somewhat detailed description so far of your understanding of the geology.

With respect to the location of TexCom's prospective injection well, is that included in the area of the Conroe field that you have just described with your detailed analysis of the geology?

A Yes, sir.

Q Okay. Let me ask you: I think you sort of touched on it, Mr. Herber, but since the unitization process and since the time of the reports and the studies that you've looked at, has there been anything concerning the Conroe field and with specificity, the area of the injection well that's the issue of this hearing, has there been any change in the geology that would cause you to -- or a person in your position to say that there's been a significant alteration of what you've just described?

A No, sir.

Q All right. Let me ask you: Mr. Herber, are you at least familiar with Denbury's prospective enhanced oil recovery program?

A I have a -- I have a general understanding. And let me share with you something.

My assignment at Denbury is to Chambers County where I am responsible for a field called Oyster Bayou, and we just finished unitizing or -- excuse me -- we just proposed to unitize Oyster Bayou for the same process. I'm not a part of the Conroe team.

The other part of it is that we acquired this from Wapiti in December of 2009. So the actual concrete plan for Conroe have not been formalized, if you will, but the basic process that has been applied to Oyster Bayou is going to be the same process that will be applied to Conroe.

Q All right, sir. And I want to try and ask this next question thoughtfully, if I can.

Given your description of the Conroe field, including the area around the proposed injection well, and given your description of the geology, as you understand it, of the field, including the area around the injection well, what, if anything, will the enhanced oil recovery process which involves, as I understand it, injection of liquid CO2, what will that do to the

geology, if you will, of those sands that you've just been describing in the Conroe field?

A Okay. There's basically two parts -- or two parts to that question. Okay?

The first part is pressure related. Okay?

Q All right.

A When you inject the CO2, what you are trying to do is get the CO2 to contact the oil; and the higher the pressure is, the CO2 is, the more effective it is in changing the characteristics of the oil to allow enhanced recovery. So the closer we raise that pressure to original pressure or slightly above, then the higher our recovery ability will be.

The original pressure was somewhere around 2700 pounds, roughly, and that's probably our target for -- so we're wishing to basically refill up the pressure that was -- that we've -- that's been taken off by the primary and secondary production to date. Okay? That will -- that pressure will be -- because the whole Cockfield is in communication, that pressure will be transmitted downward also to the lower Cockfield.

Q All right.

A The other part of that question is, the CO2 is under liquid and water free, so it's noncorrosive at that point. It's pure, and it's pumped out, it's super

critical into the injection well, goes into the formation. At that point, it contacts water and forms a weak carbonic acid.

In the production side, all our tubulars are coated as will be at our production facilities. Down in the actual formation itself, that weak acid will dissolve a little bit of carbonate material from. The little 14-foot core that Crossroads took, that analysis show there's very little carbonate within the lower Cockfield or middle Cockfield. From the cores that we have, we also -- that were taken in the upper Cockfield, that's where Exxon and many of the other companies took their core because that's where the production was. There's very little carbonate, a very small percent. So as far as changing the formation, it'll be very minor.

Q All right, sir. Let me ask you: Mr. Herber, have you reviewed any seismic data in the Conroe field, especially the area around the proposed injection well, with respect to an examination or determination of the faults down in the ground?

A I have. And that's been something that's probably the only thing that the other parties haven't been able to see due to our licensing agreement. Ballard Exploration shot a proprietary 3D over Conroe field.

868

MR. RILEY: Objection. If I understood the witness correctly, this is material he's relying upon that we have not been able to see. Did I understand that correctly?

MS. MENDOZA: Your Honors, we offered this -- we notified all the parties that this was a part of what he had relied upon in our disclosures some time ago. When we received an inquiry about it from TexCom, we informed them that our license agreement did not allow us to produce it without an order from the Court. We offered to confer with them about this. We received no response from them about it. We offered that again in the deposition of Mr. Herber, when Mr. Riley pulled this up. They have not sought an order from this Court to obtain this information.

The burden is upon the party seeking the discovery to do that, and we simply needed to receive an order in order to produce this information to the other parties and allow them to view it so that we could comply with our license agreement. They did not seek an order from this Court, and that burden was upon them to do that.

MR. RILEY: That's simply incorrect. The burden is upon counsel who's producing an expert witness to provide all material with which their expert relied

869

upon. If they need to protect that material, they could seek a protective order as they did in this case. There's no distinction for special licensing agreements and special requests. All the information this witness was relying upon for his testimony and now what I would consider as friendly cross-examination is -- should have been produced under the rules of discovery. Simply. And if there needed to be a greater protection for certain licensed material, then it is upon -- it's upon the party seeking protection to apply to the Court.

In addition, this is quite clearly cross-examination, friendly cross-examination. We had -- this was not in Mr. Herber's prefiled testimony. We had no reason to expect it to come to light or to be solicited by or elicited by another party, so really the point and time to discuss this is presently.

MS. MENDOZA: Your Honor, Mr. Herber's testimony did reference seismic. I'm looking for the reference. But he disclosed on Page 12 of 13 of Exhibit 13 that, "However, I know from other information that I have reviewed, including seismic data, there are more faults in the field that are shown on the geomap are on TexCom's maps."

MR. RILEY: There's a lot of seismic data --

870

MS. MENDOZA: So this would clearly --

MR. RILEY: -- in the world. There's seismic in the Railroad Commission files.

There's -- ferreting out what Mr. Herber relied upon is not our obligation. It is counsel's obligation to provide all material. To the extent that there is some material she cannot provide because of other arrangements, she needs to seek protection for it. Not another party.

MS. MENDOZA: Your Honor, we disclosed this. Mr. Riley had a deposition. He had plenty of time to ferret out exactly what material this was. We offered to confer with them. We -- you know, if it -- once the objections or the claims have been served, the burden to secure a hearing to resolve the discovery dispute is on the party seeking the discovery. They did not raise this.

Mr. Riley himself was well aware of this. It came up in the deposition. We notified him in the deposition of our issue. We offered to try to resolve this matter. They did not take us up on those offers of trying to resolve this. And now he is saying because we did nothing to resolve the dispute -- he's saying because he did nothing to resolve the dispute, now we are precluded from talking about this in some way or

871

having somebody talk about it in some way.

It was in his testimony. It was known that he used seismic. There is testimony out there. And it was TexCom's burden once we said that there was a privilege -- or not a privilege, but that there was a protective order that was needed, if they wanted to view it, they needed to come get it. They did not ask to do that and so...

MR. RILEY: Judges, there is a protective order in this case.

JUDGE WALSTON: Hang on just a second. At this point, Mr. Walker, do you remember specifically what is the question you asked the witness, or do we need to ask the court reporter to read it back?

MR. WALKER: It would probably be best if the court reporter read it back, Your Honor. She's younger than I am.

(The record was read as requested)

JUDGE WALSTON: You can just simply answer that yes or no.

A Yes.

JUDGE WALSTON: All right. At this point, I'll not rule on the objection. Go ahead and ask your next question.

MR. WALKER: Thank you, Your Honor.

872

Q (BY MR. WALKER) Is it fair to say, Mr. Herber, that the Conroe oil field is a multi-faulted oil field?
A Yes, sir.
Q Is it fair to say that the Conroe oil field is one where there is communication among all the sands?
A Yes, sir.
Q Is that knowledge and that determination really almost part and parcel, at least to a degree, of the fact that it's a unitized field?
A That was the basic premise for unitization, yes, sir.
Q All right. Mr. Herber, is it possible to find real estate in the state of Texas which does not have underneath it oil-producing sands?
A Yes.
Q Is it possible to find real estate in the state of Texas that does not have underneath it a layer of aquifers, water-producing underground sources of drinking water?
A No, sir.
Q No, sir? Okay. Can you expand upon that last answer? Are you saying that there's water-producing aquifers under every aspect of real estate in the state of Texas?
A You're asking me some questions that are really

873

outside my area of expertise.
Q All right.
A But if I may, to my knowledge, if you were to drill a water well within the state of Texas, you would probably find something that was drinkable.
Q Okay. That's a good answer. Thank you, sir.
In your opinion, as a geologist, and with your knowledge of the Conroe oil field, can you imagine places to inject Class I industrial waste that would have fewer complications and fewer issues than the Conroe oil field?
A Hypothetically, yes, sir.
Q Given your understanding of the geology of the Conroe field that's -- well, let me ask you: It does continue to produce oil, does it not?
A Yes, sir. It's currently producing. And I'm a geologist. It's not my area of responsibility. But it's roughly 2,500 barrels of oil and gas with associated water and gas.
Q All right. Given other possibilities, other geological strata that might be available elsewhere in the state of Texas, is the Conroe field a good place for a Class I industrial wastewater well to be located?
MR. RILEY: Objection. In what context? Traffic? There's -- and geologically speaking, is that

874

what we're confining the answer to?
MR. WALKER: I'll rephrase the question, Your Honor.
Q (BY MR. WALKER) Given your knowledge of the field, Mr. Herber, given your knowledge of the oil production that's going on in the field, given your knowledge of the strata, the communication of sands, can you imagine a better place to have a Class I injection well where it would disrupt fewer other activities, such as drinking water and oil production?
MR. RILEY: Objection. None of that's been proven in this case. It's been disruption of anything, so --
MR. WALKER: I'm asking this expert witness his opinion, Your Honor.
MR. RILEY: You're also suggesting that there's a fact that's been established, and you're assuming facts not in evidence.
JUDGE WALSTON: I'll sustain the objection to the way the question was worded. If you can --
MR. WALKER: Thank you, Your Honor.
JUDGE WALSTON: -- word it differently.
Q (BY MR. WALKER) Let me ask you this, Mr. Herber: Do you think the location of TexCom's well in the midst of the Conroe oil field is in the public

875

interest?
MR. RILEY: Objection. He's not a public interest expert. You have to define public interest. He's not a legal expert. He's a geologist.
JUDGE WALSTON: Your response?
MR. WALKER: My response is that he's been qualified as an expert, and I'm asking him his opinion as a geology expert if he thinks the location of the TexCom well in the midst of the Conroe oil field is in the public interest.
MR. RILEY: The science of geology does not extend to public interest. It is a study of rock stratum below the earth. He does not have the qualifications to testify as to what is in the public interest.
JUDGE WALSTON: Since we do have a specific public interest issue and specific grammar to that, I think I will sustain his objection.
MR. WALKER: Thank you, Your Honor. With that, I will pass the witness.
JUDGE WALSTON: Public interest counsel?
MR. McWHERTER: No questions.
JUDGE WALSTON: TexCom?
MR. RILEY: Yes, sir, thank you.

876

CROSS-EXAMINATION

BY MR. RILEY:

Q Good morning, Mr. Herber.

A Good morning, Mr. Riley.

Q If I understood your responses to Mr. Walker regarding unitization, it's about making money. Is that correct?

A No, sir, it's not totally about making money. It's also to preserve the natural resources of the state of Texas.

Q Okay. So the natural resources of the state of Texas that are preserved by the unitized interval is what was the subject of the hearing, the hearing that you mentioned earlier in the 1970s. Is that correct?

A Yes, sir.

Q What interval is unitized, sir?

A The unitized interval is captured on that type log, I think.

Q Okay. Do you have something in front of you that would help you discover what area is unitized, both aerially and at depth?

A I think one of my exhibits.

Q Take your time.

A Okay. Can I look at those?

Q Certainly.

877

A I'm looking at Exhibit 16, so everybody else can follow along.

Q Tell me the top in depth, if you can, of the unitized interval.

A Okay. This is a cross section here that we're looking at. It's stratigraphic cross section. If you look at the Humble D.A. Manley -- Madeley No. 45, that is the Conroe type log that was used in a unitization hearing. That was used to define the unitized interval. You can see that up there, roughly around 4680 in that well, is the top of the unitized interval.

Q And the bottom of the unitized interval, sir?

A The bottom of the unitized interval on this log is roughly 5420.

Q So is that, then, considered the unitized interval in terms of depth into the earth?

A No, sir. It's slightly more complicated than that. Those are measured depths. And what you need to do to -- you need to correlate each individual log to this, if you will, ruler or yardstick to determine where that equivalent sand or interval is and adjacent wells or within the field. The complication is caused by the topography, and so you -- it's not just a -- it's not just a straight, measured depth deal. You have to correlate.

878

Q In the -- I'm sorry.

In the area, then, we've been discussing, the D.A. Manley (sic), is that a well specifically?

A Yes, sir. It's a well that was drilled to well into the Wilcox.

Q Okay. And that's below the Cockfield. Is that correct?

A Yes, sir.

Q So there's a -- in the area of the D.A. Manley well, what is the top -- what is the bottom depth of the Jackson shale?

A It would -- the bottom depth of the Jackson shale would also correspond to the top of the unitized interval.

Q So that's 4680. Correct?

A Yes, sir.

Q And what is the -- what is the bottom depth of the Cockfield Formation?

A Well, that's open to interpretation or --

Q I'm asking your opinion, as a geologist.

A I understand. There's several ways you can get at that answer. One of them with paleo information, paleontology information. And if you were to use that information, you would look for the first occurrence of some Cook Mountain forams. Some of that -- I have seen

879

one instance of one --

Q Sir. Sir, I'm asking you a simple question, I hope.

What is your opinion in that well -- in a number, not a reason why -- but what is your opinion, whatever methodology you use, as the bottom of the Cockfield Formation?

JUDGE EGAN: Are you talking about just in the Madeley well?

MR. RILEY: Yes, ma'am.

JUDGE EGAN: Thank you.

A If you look at that exhibit, there's some sands that are shaded light blue. The basal part of that sand, that's the bottom-most one, it's roughly at 6,080, roughly.

Q (BY MR. RILEY) So that would be the bottom of the Cockfield Formation, as best you can give it to us this morning. Correct?

A In that well, yes, sir.

Q All right. So there is a portion of the lower Cockfield that was not unitized. Correct?

A There is a large portion of the Cockfield that is not unitized.

Can I elaborate, sir?

Q No, sir. Maybe to somebody else, but I'm just

880

asking you some pretty discreet questions. I hope you'll confine your answers to my question.
A Yes, sir.
Q Thank you.
Did you look at some Exxon -- or information developed by Exxon from the 1930s?
A I looked at a --
Q Sir. Sir, again: Did you look at some information developed by Exxon relative to the Conroe oil field in the 1930s? Yes or no?
A Exxon didn't exist in the 1930s.
Q Okay. Was it Humble in the 1930s?
A Yes, sir.
Q Did you look at some information developed by Humble?
A There was an AAPG article that was authored by a Humble geologist in conjunction with a Conroe association engineer.
Q What was the date of that report?
A It was published in 1936.
Q What was the purpose, the best you understand it, of that report?
A It was published in AAPG.
Q What is AAPG?
A American Association of Petroleum Geologists.

881

They issue a monthly bulletin to their members, and it was one of the articles in that bulletin. It was -- in that period of time, it was common to have articles on different fields as informational to other members of the AAPG so that they could learn from those -- from their other geologist studies.
Q Thank you.
In the '70s, there was a hearing before the Railroad Commission -- or proceeding before the Railroad Commission to unitize the Conroe field. Is that correct?
A Yes, sir.
Q And you explained to Mr. Walker that unitization is about "cutting up the pie." Did I understand that correctly?
A Those are my words, yes, sir.
Q All right. So "cutting up the pie," what pie are you cutting up, then, sir?
A In exchange for everybody joining in and having some common operator run the field, who makes decisions for the group, and having all the oil and gas come to one common point and then the proceeds would be distributed proportionately, depending on your original lease.
(Cell phone ringing)

882

Q (BY MR. RILEY) That reminds me.
MR. RILEY: And by "That reminds me," since it's not on the record, there's a ringing phone just so the record's clear.
Q (BY MR. RILEY) So there's a likelihood, I would say -- maybe you disagree, and please tell me if you do -- that there's argument or dispute possible in a unitized -- or in a unitization proceeding. Is that correct?
A Yes, sir, there usually is.
Q And that's because folks have different views of what piece of the pie they're entitled to. Is that correct?
A Yes, sir.
Q So at least anybody who's proceeding or participating in a unitization hearing or proceeding before the Railroad Commission would be advocating, potentially, for difference -- a different view of geological conditions saying that they're entitled to a bigger piece of pie than, perhaps, somebody else. Would you agree with me there?
A That potentially theoretically could happen.
Q Did it happen in the Conroe field, the best of your knowledge?
A I wasn't involved in those proceedings. I

883

would be remiss to state anything. I don't know.
Q Well, would it surprise you, sir, that there was a unitization hearing in the -- regarding the information developed by Exxon for the Conroe field? Are you aware of that?
A No, sir.
Q So you haven't looked at anybody else's perspective who might have been involved in that hearing as to their opinion as to the geology of the Conroe field. Is that true?
A Could you rephrase that question for me, sir?
Q It's my understanding -- correct me if I'm wrong -- that you looked at some information regarding the unitization of the Conroe field developed by -- it wasn't Exxon in that time either, but the predecessor in interest to ExxonMobil Corporation. Is that correct?
A Are we still referring to that 1936 article, sir?
Q No, sir. Let's talk about the '70s. Okay? I'm talking about the unitization proceeding before the Railroad Commission.
A Okay. At that point it was Exxon, sir.
Q Well, let's see. I worked for Exxon in 1982, and they had just changed their name to Exxon. So I don't think you're correct, but that's not really

884

important.
A Okay.
Q But the Exxon Corporation -- and its ExxonMobil Corporation, as it's known now, and it's predecessors and interest in the Conroe field, can we just use Exxon to refer to all those entities?
A That would be most convenient.
Q All right. Good.
So in -- what year was the hearing before the Railroad Commission on unitization in the '70s?
A I believe the unit was approved in 1978.
JUDGE WALSTON: 1970 what?
WITNESS HERBER: 1978.
Q (BY MR. RILEY) Do you know when unitization -- well, let's start again.
Do you know who applied to unitize the field?
A I believe Exxon and the people of the technical subcommittee.
Q And who were the people of the technical subcommittee? Were they companies, or are you talking about individuals?
A No. They were -- there were 20-plus companies.
Q Were those 20-plus companies all members of the technical subcommittee?

885

A To my knowledge, yes, sir.
Q Did you review the record of the proceeding, the entire record of the proceeding, before the Railroad Commission that resulted in unitization of the Conroe field in 1978?
A No, sir.
Q Is it correct that you only reviewed the Exxon report regarding unitization?
A I looked at a MER study that was found in our files from Wapiti, and I looked at two papers that were listed in -- one was in the Journal of Petroleum Technology. The other one was an SPE paper. They -- the authors of both those papers were employed by Exxon.
Q What's an MER study? I'm not familiar with that term.
A I don't -- I'm sorry, I don't know what MER stands for. That was what's on the cover of the study I looked at.
Q That's fine. I'm not sure that's important. I'm just trying to understand the -- what type of study was it, then?
A It was trying to summarize at a point in time -- I mean, it had a date on it -- the understanding of the technical subcommittee at that point in time. It had various geologic, engineering, production. There's

886

a little bit of land information in there, so forth and so on. It was just sort of like the understanding at that point in time from the technical subcommittee.
Q And there were two papers cited in that study, and you said that they're each authored by Exxon employees. Is that correct?
A No. Those paper were not cited in that study.
Q I'm sorry.
A Those --
Q I apologize.
A Those were just separate things that would -- trying to answer your question about what I read from the Exxon that would be in the '70s.
Q Okay. And those two papers, then, were authored by Exxon employees or folks working for Exxon, and they related to the Conroe field. Is that correct?
A Yes, sir.
Q Mr. Herber, you've been here in this proceeding from the first day to present. Is that correct?
A No, sir. I've intermittently left.
Q Were you here for the testimony of another geologist in the case by the name of Philip Grant?
A I was here intermittently. I didn't hear the beginning of his testimony. I heard the very tail end of it.

887

Q Have you reviewed Mr. Grant's prefiled testimony in this matter?
A I have read it once.
Q Do you have an opinion -- well, let's go over a few qualification issues first.
Are you a licensed geologist to practice -- excuse me -- are you licensed to practice in the field of geology in the state of Texas?
A No, sir, I'm not a registered geologist in the state of Texas.
Q In fact, if I recall from our deposition, Denbury does not employ any geologists, of the 30 or so geologists it employs, that is licensed in the field of geology in the state of Texas. Is that correct?
A That's my understanding, yes, sir.
Q Do you know if Mr. Grant is licensed in the field of geology or practices geology in the state of Texas?
A That's what is on his vitae. He is a PG, a licensed professional geologist.
Q It's my understanding from the deposition I took of you in this case, that you consider licensure in the state of the Texas to be largely a marketing tool for geologists that don't work for companies. Is that true? I can find the testimony, if you'd like.

888

A No, I recall exactly what I said, Mr. Riley.
Q Did I accurately recount it, then?
A Can I qualify my answer, sir?
Q Sir, did I accurately recount that you swore under oath in your deposition that licensure in the practice of geology in the state of the Texas is largely a marketing tool for independent geologists? Is that correct?
A That's what I said then. I've had some chance to reconsider.
Q Sir, that's what I asked you. Didn't ask you anything further.
Your deposition was taken May 20th, 2010. Correct?
A Yes, sir.
Q All right. Mr. Grant testified in this proceeding regarding his opinion for the 4400-foot fault. When I use the term 4400-foot Fault, do you know what I'm referring to?
A Yes, sir.
Q What do you understand it to be?
A It's a fault that is basically 4400 feet away from the TexCom well, almost directly south, that most geologists in this proceeding believe is there. And it's probably consistent on most maps that you would

889

look at from almost any source.
Q Do you have an opinion as to the transmissivity of that fault?
A I do.
Q What is your opinion about the 4400-foot Fault?
A This is a two-part answer, if you will.
The 4400-foot Fault is a -- mainly a growth fault.
JUDGE EGAN: A what?
WITNESS HERBER: Growth fault.
JUDGE EGAN: Thank you.
A What that means is it moves during deposition. Another term for that growth fault is -- or another term that geologists use is syndepositional meaning that during deposition, this fault is active. And what it does is it creates accommodation space, so it allows the horizons to basically expand like an accordion, if you will. So it's a complication in correlation.
So over the -- a structural high, often caused by salt in this area, the sediments are slightly thinner; and off the high, off structure, the sediments are slightly thicker. Okay? So this fault has been constantly active episodically through time, so it moves.
The other tenet of a growth fault, it's

890

throw --
Q (BY MR. RILEY) I'm sorry. I couldn't understand the word you said. Could you --
A Another tenet of the growth fault is that its throw is variable. So it -- if you were to look at a fault cut in a well of a growth fault, at one intersection point it may have, say, 160 foot of throw. At a different fault cut, it might be -- cut the fault deeper geologically. The throw -- it will be slightly larger.
So that's a tenet of -- or that's the characteristic of a growth fault. It has variable throw. It's not a constant throw. So it adds a complication to your interpretation of that fault because oftentimes when geologists try to map a fault with well cuts, they're looking for something that has similar throw. In other words, if I had a fault cut with a hundred foot and another well with hundred cut foot fault here, it makes it easier to say that's probably the same fault. So it makes your interpretation of the fault a little more complicated.
As far as the shale smearing --
WITNESS HERBER: And Mr. Riley, during my deposition, gave me --
Q (BY MR. RILEY) Sir, I don't know where you're

891

headed, but I asked you a question. And I think it was limited to, "Do you have an opinion as to the transmissivity" -- maybe I didn't. So let me interrupt you and ask you if you have an opinion as to the transmissivity of the 4400-foot fault?
JUDGE WALSTON: I think that was the question. What is your opinion of its transmissivity?
WITNESS HERBER: Okay. I'm sorry. I may have digressed. I apologize to everybody here.
A The principal here is shale smearing.
Q (BY MR. RILEY) Well, I'm sorry. Let's start with the basics. Okay?
Do you have opinion on the transmissivity? I thought you said yes.
A Yes.
Q Okay.
A I'm trying to explain my opinion.
Q Well, before you explain it, why don't you tell us what it is. Is the fault transmissive or not?
A My answer is somewhere between it's transmissive in places and not transmissive in other places.
Q So you said --
JUDGE WALSTON: Just so we're clear, Mr. Riley, on your question.

892

Is this lateral transmissivity you're talking about --

WITNESS HERBER: I'm talking --

JUDGE WALSTON: -- or vertical or both?

WITNESS HERBER: All of it. All -- Your Honor, all three.

Q (BY MR. RILEY) Okay. I think I know what three you're talking about, but I'll give you a chance as we go through, to go through each of them. All right?

You say that somewhere -- it's somewhere in between. It's not -- it's neither transmissive or non-transmissive. Is that another way to say what your opinion is?

A There are places where it wouldn't be transmissive. There are places where it would be very transmissive.

Q So basically, very transmissive to non-transmissive is the range of possibilities?

A Yes, sir.

Q And your opinion on the 4400-foot fault is it -- depending, I suppose, on where you're looking, it's any of those?

A Yes, sir.

Q Now, Judge Walston asked you about the type of

893

transmissivity. You said there -- I think you alluded to three possibilities.

A Yes, sir.

Q Let's talk about horizontal first. I think that's the term we've been trying to hold to, but I guess lateral is also a way to say it. But I'm referring to transmissivity, I guess, on the horizon or --

A Through the fault.

Q -- lateral direction.

A Through the fault.

Q Yes, sir.

A Yes, sir.

Q Okay. So you have an opinion as to whether the fault is horizontally transmissive?

A I do.

Q And what is your opinion?

A It's variable, depending on --

Q Okay.

A Is that what you need to hear?

Q Yeah, just if that's -- that is your opinion?

A Yes, sir, it's variable.

Q So in some parts along the fault, I guess, as I understand it, then, it would be non-transmissive. In other parts, it might be transmissive. Is that correct?

894

A Yes, sir.

Q Now, do you agree with -- well, I think it was introduced by Mr. Casey but Mr. Grant testified about it, also, that as a general matter, vertical transmissivity is about ten times less than horizontal transmissivity.

A I think we're taking -- we're mixing apples and oranges here, Counselor.

Q We may be, but for my purposes, let's not talk about the fault for a second.

As a general rule, in a depositional environment, is it -- is that a rule of thumb, a useful rule of thumb, that it's about ten times less -- the stratum is ten times less transmissive in the vertical direction over the horizontal direction?

A No, sir.

Q Okay. So you don't agree with the rule of thumb that vertical transmissivity is, as a general matter, less than horizontal transmissivity within a sand or depositional environment?

A My direct experience in Oyster Bayou, we've taken some vertical and horizontal permeability measurements, and we had a one-to-one ratio. So that, by my experience, would sort of negate the rule of thumb.

895

Q Well, that's certainly -- that's why we call them rules of thumb.

But in a general sense, are you saying that that's not true, that ten-to-one is not a good rule of thumb? I understand you had a different experience, and it sounds like a single experience. But generally, you've been practicing geology for at least 20 years. Is that right?

A Almost 30 years, sir.

Q Almost 30 years.

A As a rule of thumb, horizontal transmissivity or horizontal permeability is usually greater than vertical. But it's -- the ten-to-one number that you're using is not something I've heard of. That's why we always -- if we're really interested in that information, that's why we measure it with core.

Q Okay. So I think that was -- I think we covered horizontal transmissivity, and we're talking about the 4400-foot fault again.

Is it vertically transmissive, either along the fault plane or by -- well, let's talk about along the fault plane.

A Are we talking about -- I think in the previous testimony, they're using the wall as the fault.

Q Yes, Ms. Mendoza asked some questions of a

896

witness earlier about the fault plane being the window and then the other side of the fault being south of the 4400-foot fault and the room being north of the fault?

A And bilateral, we're talking along the wall? Is that what we're talking?

Q Let's talk about -- let's talk about vertical up the wall. Is that a fair word or --

A Yes, sir.

Q Okay. Is the fault itself on the plane of the window, as we've been describing it, vertically transmissive?

A Yes, sir, it is.

Q As compared to the horizontal transmissivity that we just discussed, is it more vertically transmissive or less, in your opinion?

A In my opinion, it's more because I understand, sort of, the genesis of the faults.

Q Okay. So in your opinion, it's more transmissive along the fault plane vertically. Is that correct?

A Yes, sir.

Q All right.

A Would you like any explanation?

Q No, sir. Someone might ask you. I'm just asking your flat-out opinion. We're trying to move this

897

along. We've got a lot of witnesses and a couple days to discuss these items with them.

A Thank you, sir.

Q Let's talk about once we're through the fault.

In our example, we're on the other side of the fault into -- would it be the middle Cockfield, if we're talking about the formation at -- or that's the subject of this case?

A Okay.

Q All right. Is the middle Cockfield vertically transmissive?

A Yes, sir.

Q And --

JUDGE WALSTON: Did you say yes or no?

WITNESS HERBER: Yes, sir.

Q (BY MR. RILEY) Am I correct that we've been talking about the horizontal transmissivity across the fault, so it would be the lower Cockfield sand into the middle Cockfield sand. Correct?

A At the 4400 fault, that would be correct.

Q All right. So now -- not asking about the plane of the fault. I'm asking about the sand on the other side of the fault. We're outside the window the way we've been discussing it.

What is the vertical permeability of the

898

middle Cockfield -- excuse me. I said permeability -- the vertical transmissivity of the middle Cockfield as it pertains to the horizontal transmissivity of the lower Cockfield? Is it lesser? Greater? Any opinion?

A Based on your guidance here, it's the transmissibility of the middle Cockfield is the same as the lower Cockfield. Is that your question, sir?

Q Yes, sir. And I think, if I'm understanding, then, so we're talking about -- let's see. I'm imagining a fluid going through the formation. We call it the lower Cockfield.

A Yes, sir.

Q Okay. And in relative terms, is what we're discussing, there's a transmissivity through that formation. Correct?

A Yes, sir.

Q And then once you're on the other side of the fault, leaving aside the plane of the fault, you're into the middle Cockfield sand. Correct?

A Yes, sir.

Q In relative terms, is the middle Cockfield more vertically transmissive than the lower Cockfield is horizontally transmissive?

A By definition, you know, the main vertical conduits are other small faults and fractures, and those

899

faults and fractures have higher permeability than the actual sands themselves. So the vertical transmissibility, where those fluids would intersect the faults and fractures, you know, smaller than the 4400-foot fault on the other side would have higher vertical permeability.

Q So higher than the horizontal permeability or transmissivity of the lower Cockfield? Is that what you're saying?

A Yes, sir.

Q All right. Earlier, when we were talking about the plane of the fault -- excuse me -- you used the term "laterally." And I'm going to -- I took it to mean along the window. Not up the window, but along the window. Is that correct?

A Yes, sir.

Q And is it my understanding, then, you believe the fault to be laterally transmissive?

A I do.

Q Some of the reasons that you offer for communication between the Cockfield sands or among the Cockfield sands, might be a better way to say it, is pressure data. Is that correct?

A Yes, sir.

Q And there's a particular well of, I would

900

say -- I'll call it of concern, but it's referenced in the Denbury testimony by yourself and others as indicative of the communication. Do you know what well that is?

A It's a well that was drilled by Wapiti. It's a 2315D. That well had some formation RFT pressure points taken in it at various depths, and there have been various bottomhole pressure measurements in the TexCom -- current TexCom well that were...

Q So that's the well, then? I think my question was: Do you have a well? You said it was 2315D, and then you said some other stuff.

But my question was: Is there a well that you referenced?

A I apologize.

Q That's okay. Gave me a chance to write it down.

Let's talk a little bit about the pressure measurements in the context of our discussion. There are pressure measurements made in various wells, and those are indicative to you and others of communication in the Cockfield Formation. Correct?

A Yes, sir.

Q In 2315, there were some pressure measurements made. I assume by Wapiti, but it may have been Denbury.

901

Do you know who made the pressure measurements in that well?

A I would have to look at the log.

Q Okay. Do you have that available to you?

A I do.

Q All right. Could you take a moment and find it, and show me what you're looking at.

A Okay.

Q Thank you.

A (Witness complying.) The log that I have in my hand is a 5-inch. It's an array dual induction spectral density log. It's the same log that TexCom ran in their well. It was logged by Halliburton, the same company that logged the TexCom well.

Q Okay. That looks like a big document just from across the room here. Is it -- is that true?

A Yes, sir.

Q Okay. Is there an identifier in the document? Looks like a DN, typically, with a -- some letter, maybe, and number?

A No, sir. This is my personal copy.

Q That's your personal copy. Let me hand you -- and I apologize. I don't have copies of this for everybody. It's a disclosure document labeled DEN-B00018. I'm going to hand you this and see if you

902

recognize it.

MR. RILEY: Perhaps we should mark it TexCom Exhibit 102, I believe we are.

(Discussion off the record)

(Exhibit TexCom No. 102 marked)

JUDGE WALSTON: We've been going almost an hour-and-a-half. So why don't we go ahead and we'll take our morning break, and that will give the parties a chance to look over this document. So we'll resume at 9:40.

MR. RILEY: Thank you.

(Recess: 9:24 a.m. to 9:42 a.m.)

JUDGE WALSTON: Okay. We're back on the record. Mr. Riley, you can proceed.

MR. RILEY: Thank you.

Q (BY MR. RILEY) Mr. Herber, I think you have before you now what's been marked as TexCom Exhibit 102.

A Yes, sir.

Q Have you seen that exhibit previously?

A Yes, sir.

Q All right. And is it something that you viewed as part of your work in this case?

A I directed this work.

Q All right.

MR. RILEY: At this time, Applicant offers

903

TexCom Exhibit 102 into the record.

JUDGE WALSTON: Any objection?

(No response)

JUDGE WALSTON: Okay. TexCom Exhibit 102 is admitted.

(Exhibit TexCom No. 102 admitted)

Q (BY MR. RILEY) Mr. Herber, what are the graphs on TexCom Exhibit 102? There are three of them, but in general terms, what are they called?

MS. MENDOZA: May I approach the witness and look on at the same time?

JUDGE WALSTON: Yes.

MS. MENDOZA: Thank you.

A Are you talking about the things in the calmer sense? Is that what you're asking?

Q (BY MR. RILEY) Just trying to get a vocabulary going so we can refer to these various things as we go through your examination.

A The most common term for these are well logs.

Q Okay. And we've been using that term with other witnesses. But generally, what is a well log?

A These particular well logs are one-inch correlation logs, and they represent the measurements that are done while the well is still open, uncased with various electrical devices.

904

Q They take readings of the wellbore. Is that correct?
A Correct.
Q And then they generate -- I'll call it a graph of some sort, or reflect the data taken by those instruments. Is that correct?
A Correct.
Q And that tells folks who know how to read them certain things about the geology. Is that correct?
A You make some interpretations of the geology from these things.
Q Okay. Now, there are three -- excuse me -- if I understand -- sorry.
If I understand the exhibit, there are three well logs depicted. Is that correct?
A Yes, sir.
Q And what wells are logged and represented on the -- in the exhibit?
A The previously mentioned Humble D.A. Manley 45; the Wapiti operating Conroe Unit 2315D; and the Crossroads Environmental WD315, now probably known through conversations we've had here as WD410 owned by TexCom.
Q There's some marks that are outside of the boundaries of the logs themselves. Did you make those

905

marks, or did you cause those marks to be made on the exhibit?
A Can you be more specific? I'm -- there's several marks on this.
Q Sure. There's some lines -- and I don't have a copy in front of me, but from memory, there's some lines that are blue. You see the blue lines? Maybe they're not blue.
MR. RILEY: Can I approach the witness?
JUDGE WALSTON: You may.
MR. RILEY: They were green. Sorry.
Q (BY MR. RILEY) There are some green lines that are depicted on the exhibit. Could you explain what they indicate?
A They're trying to correlate the unitized interval.
Q Was that your work or someone else's?
A This work was directed by me.
Q When you say directed by you, did you instruct somebody else to do the work?
A I did.
Q Who did you instruct?
A Randy McKenzie.
Q It's my understanding that Mr. McKenzie is actually the geologist within Denbury assigned to the

906

Conroe field. Is that correct?
A Yes, sir.
Q He's not available because he's on vacation. Is that correct?
A Yes, sir.
Q And you are filling in for Mr. McKenzie. Is that right?
A Yes, sir.
Q As between you and Mr. McKenzie, Mr. McKenzie has superior knowledge of the oil field we're discussing in this case. Is that correct?
A I would beg to differ with that statement.
Q Okay. All the information you've gained about the Conroe field has been gained since April 28th, 2010. Is that true?
A Yes, sir.
Q And Mr. McKenzie's been working on it since acquisition in December 2009. Is that correct?
A No, sir.
Q All right. When did Mr. McKenzie become familiar with the Conroe oil field, the best of your knowledge?
A Sometime in the early part of 2010.
Q All right. But certainly before you did. Correct?

907

A Yes, sir.
Q And he has responsibility for the field?
A He has geologic responsibility.
Q All right. Well, that's kind of what we're talking about.
But he has geologic responsibility within Denbury for the Conroe oil field. Correct?
A There are some other geologists assigned to that team.
Q Is he the primary geologist assigned to the Conroe field?
A Yes, sir, I think so.
Q And you were tasked with this assignment after it was learned that there would be -- there was a hearing date and Mr. McKenzie would be on vacation. Correct?
A Yes, sir.
Q All right. So you asked Randy McKenzie to do some work, and you've just described that. And he placed some lines on the diagram before you, TexCom Exhibit 102. Correct?
A Yes, sir.
Q And the green lines depict correlation from the well logs of the three wells described as to the location of stratum indicated by the well logs. Is that

908

correct?
A Yes, sir.
Q Are there markings on the exhibit pertaining to depth? In other words, are the well logs marked by depth?
A Yes, sir. In the center part of each of these graphs, as you referred to them, there's depth.
Q Okay. And so that would be depth in feet below the surface of the earth in the wellbores in question. Correct?
A Not exactly from the surface of the earth. They're usually measured from the Kelly Bushing of the rig, when the well is logged.
Q I'm sorry. I didn't understand your term. Tell me what it is, again? Where are they measured from?
A From the Kelly Bushing. Usually there is a reference point, so however high the rig floor is above ground level is the -- usually the datum for these logs.
Q Is that consistent, then, in well logging, that the Kelly Bushing is placed at some certain height above the surface of the earth or below the surface of the earth, whatever it is?
A Well, and it varies with the size of the rig. So your rig floor varies. So just as convenience,

909

they -- when they rig up the logging tool, they zero it at the rig floor, so your datum is traditionally at the top of the rig floor where everybody can see the zeroing.
Q How far off, then, could it be from one well to the another where the Kelly Bushing is placed?
A Well, because the rigs vary in size, the rig floors vary in size, and then the complication of the varying topography. That can be significant in some areas.
Q Okay. So let me see if I understand, though.
The Kelly Bushing is above the surface of the ground? Is that right or wrong?
A Yes, sir, that's correct.
Q And the -- from the surface of the ground, would vary from topography by topography, then -- surface of the ground to the Kelly Bushing is some distance. Correct?
A Yes, sir.
Q And it varies from rig to rig?
A Correct.
Q In your experience, how much could that vary?
A I've seen rig floors vary from 5 foot to 40 feet onshore.
Q So there could be as much as a 35-foot

910

difference in the measurement of depth based on your description of the where the data -- datum is taken. Correct?
A From just the Kelly Bushing part of the equation.
Q And that's what I'm asking, so we can't necessarily correlate the depths exactly. But as I understand your testimony so far, it could be as much as off by 35 feet from the surface of the earth. Correct?
MS. MENDOZA: Objection, form. I think I heard sort of two questions there. One about how the Kelly Bushing changes, and then one about how it could correlate.
MR. RILEY: Okay.
Q (BY MR. RILEY) If I understood correctly, the variation would be 5 to 40 feet for onshore drilling would be simply a matter of the type of rig and where the Kelly Bushing is located. Correct?
A Yes, sir.
Q All right. So that could be as much as a 35-foot difference. Correct?
A Yes, sir.
Q So then if we looked at a depth measurement, given what we know about the potential difference in the Kelly Bushing location, the depth measurement could be

911

off just by -- just as a function of where the Kelly Bushing is placed by as much as 35 feet. Correct?
A Yes, sir.
Q For any of the three wells depicted in the diagram, do you know at what height the Kelly Bushing was when the measurements were taken?
A That's usually recorded on the log header of each of those wells. We didn't capture it here on this cross section for simplicity's sake.
Q My answer to my question would then be no. Correct? You don't know. As you sit there right now, you don't know. Correct?
A Yes, sir, I do not know, but I could find out.
Q All right. Did you ask Mr. McKenzie to take that into account when he made his plot?
A No, sir, because this is a stratigraphic cross section.
Q The answer to my question was no. Is that right?
A No.
Q You didn't ask him to take that into account, to correlate depth based on the Kelly Bushing height. Is that correct? Yes or no?
A It's not necessary in a stratigraphic cross section.

912

Q It's not necessary. Okay. But you didn't ask him to do it, did you?
A No, sir.
Q All right. As I understand your testimony, there is some correlation you wish us to draw between the bottomhole pressure in WDW315/410 and some of the bottomhole or pressure measurements taken in 2315D. Is that right?
A Yes, sir.
Q Is there some tool that's used to measure pressure at depth in a wellbore?
A Actually, there's several tools.
Q Okay. Was a tool used in 2315 to measure pressure at depth?
A Yes, sir.
Q And are some of the those measurements depicted in the Exhibit 102?
A They are.
Q Starting with the depth of the first measurement, what is that depth depicted in the exhibit?
A And for clarification, are you asking on the 2315D well, sir?
Q Yes, sir.
A Okay.
Q Well, let me ask another question, then, before

913

we get there, if you're confused.
Do you know of any other pressure measurements taken in either of the other two wells, other than the bottomhole pressure measurement?
A Other than the bottomhole pressure measurement in the Crossroads well?
Q Yes.
A I was just trying to make sure that I understood. We're asking about either the Crossroads well or the Wapiti well?
Q Well, let's do them separately, then.
The Crossroads well, is there any other pressure measurement data that you're aware of for the Crossroads well?
A No, sir.
Q All right. And then so the bottomhole pressure measurement that you are aware of is what, in the Crossroads well?
A The one that's on this exhibit.
Q And what is that measurement?
A At 6,000 feet, the pressure is 23 -- excuse me -- 2437 psi.
Q 2437 psi. Pounds per square inch?
A Yes, sir.
JUDGE WALSTON: And what depth did you

914

say?
WITNESS HERBER: 6,000 feet.
Q (BY MR. RILEY) Precisely? 6,000 feet?
A Yes, sir.
Q Does that correlate to a gradient number, the 2437 psi?
JUDGE EGAN: A what number? I'm sorry.
MR. RILEY: I'm sorry. A gradient number, pressure gradient number.
A You can calculate a gradient from those two numbers.
Q (BY MR. RILEY) I thought you had testified in your prefiled testimony that there was a gradient associated with the 2437 psi. Do you recall what it is?
A Well, it's labeled here on this exhibit as roughly -- the gradient is roughly 4,000 -- .406.
Q .406. And that's in psi per foot. Correct?
A What you're doing is you're dividing the depth into the pressure.
Q And by dividing the depth into the pressure -- I don't have a calculator onhand -- but I would divide 2437 by 6,000 feet, and that should give me .406. Correct?
A Yes, sir.
Q And that's indicative of a gradient number, or

915

what we're referring to or I'll refer to as a gradient number. Correct?
A That number represents a departure from the gradient that would be originally here at -- in the Conroe field.
Q Yeah, but that's not my question.
Do you understand the term "pressure gradient?"
A Yes, and that's what I was trying to explain to you, sir.
Q All right. But I'm asking you: Nothing about the Conroe field, do you understand the term "pressure gradient"?
A The gradient doesn't change through time.
Q All right. That's your opinion. Let's get to it.
So what was the original gradient pressure in the Conroe Formation at 6,000 feet in psi?
A The original gradient --
Q Sir, at 6,000 feet, do you have any data of what the pressure measurement was in the lower Cockfield Formation?
A I could with a calculator, sir.
Q I'm not asking you to calculate it. I'm looking for data. Do you have an instrument

916

measurement?
A I do not.
Q Okay. You have an opinion, no doubt, because you're anxious to get there, of the original gradient in the lower Cockfield Formation. So what is it? What is your opinion of the formation pressure inversion condition?
A Typically, Counselor, in the Gulf Coast, the typical -- if you don't know anything, the rule of thumb is .46. In that 1936 document generated by the AAPG that was authored by, I think, Mishown (phonetic) and Buck -- and I may not be saying the primary author correctly -- was 22 -- or I think it's 2275. And that was at a depth of -- I'd have to look to see what depth that was. But it calculates to be a rough gradient of .455, close to rule of thumb .466.
Q Okay.
A This is slightly -- this gradient calculation is slightly larger that's been portrayed in the Exxon unitization, which was a slightly smaller number.
Q Well, in general terms, then, the difference in pressure gradient can be attributed to a sand being isolated. Correct? Sir, yes or no?
A No.
Q Okay. So it's not because of isolation that

917

one would see a different gradient in a different place in the Conroe oil field?
A No.
Q All right. All right. Let's go back to my questions, then.
Your opinion, then, is that the original pressure gradient in the lower Cockfield is .46 psi per foot. Did I understand you correctly?
A Something close to that, sir.
Q And something close to that could be .45, could be .48. How close -- what do you mean "something close to that"?
A Something close to .45 to .46, somewhere in that range.
Q All right. So I should find that gradient -- let me say that differently.
The Conroe oil field has been -- there's been production from the Conroe oil field from what date, the earliest date where production has been known to occur?
A December of 1931 was the discovery date.
Q Okay. So 79 years?
A Yes, sir. You're better at that than I am.
Q I have limited skills.
The pressure gradient measured in 2315D,

918

at the first one, is at what depth?
A Test No. 12 is at 4940 and has a pressure measurement of 1411.72. And I might parenthetically add, those -- anything after the decimal point is silliness.
Q Okay. But that -- doing the math, you said earlier, gives me the gradient number at -- did I say -- did you say 4940 feet?
A Yes, I did, sir.
Q And what is the gradient number?
A It's .286, and we're misapplying the term "gradient" here.
Q Okay. Why am I misapplying the term "gradient"?
A The gradient doesn't change. That division that you're doing there represents the departure from the gradient. In other words, the gradient doesn't change -- you know, the original gradient doesn't change through time.
Q So it should all be .45 or .46. Correct?
A When you deplete the formation, the gradient doesn't change. The pressure in the formation changes. Okay?
Q Right. I'm with you.
A Okay. So the gradient is still there.

919

Q All right.
A The original gradient, just like the temperature gradient, all those things, they remain constant. When you deplete the formation, then you draw down the pressure.
Q So if we shut off the tap, so to speak, today, you would expect the pressure to equalize in the formation. Correct?
A That would -- eventually, with enough time, that would happen, sir.
Q Okay. And we're talking geologic time. Correct?
A No. I think we're talking in human time.
Q All right. Let's get to that in a few minutes.
But do you know how long the -- and I'm going to use -- let's use just psi per foot.
Okay. Do you know how long the reservoir or the stratum at 4940 feet has been at that number, .286 psi per foot?
A No, sir, I do not.
Q Okay.
A This --
Q How many -- well, I'm sorry.
How many producing sands are there in the Conroe field?

920

A It depends on how fine you want to divide them, Counselor. But namewise, you'd have to look at the unit type log.
Q And there are at least eight. Correct? There are two Conroe sands and then six producing layers in the Cockfield Formation. Is that true?
A There are the two Conroe sands, and then there's a sixth -- excuse me -- there are two Cockfield sands.
Q Okay.
A And then there's the six Conroe sands called main sands. There are some little strays in between some of those.
Q I'm sorry. I had it reversed in my head.
So there are six Conroe sands. Is that right?
A Six main Conroe sands. And on the type log, they have some stray subunits on them. And then above them is the -- are the two Cockfield sands, and they're predominantly gas.
Q Okay. Maybe I just have this wrong in my head. I thought we were talking about the Cockfield Formation. Maybe it is to trick guys like me.
But the Cockfield sands are the ones above --

921

A Yes, sir.
Q -- the Cockfield Formation?
A Yes, sir.
Q Okay.
A I mean, that's just -- the divisions that we're using here in our terminology here, the top of the Cockfield by TexCom is not the same as the top of the Cockfield by the unit boundary and by paleo.
Q Okay. But there are eight sands regardless of what their names are. Right? Producing sands?
A Eight plus the few strays. I would have to look at the type log --
Q Okay.
A -- to tell you exactly the exact number.
Q Be more comfortable with me phrasing it as at least eight sands, then?
A Yes, sir, that would be fine.
Q Were those eight sands measured in any way, in the context of our discussion earlier, for virgin pressure?
A At what point, Counselor?
Q When they were discovered.
A Yes, they were.
Q All right. Were they all the same?
A They were.

922

Q And what was the -- what were each of them, as best you recall, what was the -- you don't like pressure gradient number, but that's the one I'm going to go with anyway.
What was the pressure gradient number that would correspond to the .286 psi per foot or the .45, the .46 psi per foot? In each one of them.
A Based on the testimony in that AAPG 1936 article, they made a statement to the effect that they were amazed by the fact that the pressure in all the sands were the same.
Q Okay. Did you see any original data from that amazing article in the '30s?
A They had some. Besides just the written words, they had a few maps in that article that showed contours of different pressures at different wells and different places.
Q That's all from that 1934 -- I think it's 1934 -- article. Correct?
A 1936.
Q 1936 article.
All of those measurements, then, are in the upper Cockfield. Correct? Or the sands above the upper Cockfield?
A Yes, sir, they're all in the productive

923

interval.
Q Is it possible -- I'm sorry.
A Yeah, I mean, that's the interval of interest for the people producing oil and gas.
Q Is it possible that the lower Cockfield would have a lower virgin pressure?
A No, because the lower Cockfield is part of the aquifer system that's supplying the pressure for the field.
Q Well, that's your theory.
But I'm asking you: In general, then, forget this field, is it possible for actually a lower sand separated from an upper sand to have a lower virgin pressure than the upper sand?
A I haven't seen that in the Gulf Coast area.
Q That's not my question. I didn't confine it to the Gulf Coast area.
Is it possible for a lower sand, sand depth -- at greater depth than an upper sand to have a lower virgin pressure than an upper sand?
A So are -- I'm confined geographically just worldwide, what you're asking?
Q Yes, sir.
A I have experienced a -- what we call an underpressure reservoir in providences outside the Gulf

924

Coast. I have not experienced them in the Gulf Coast area, which this field is in.
Q You can keep saying that, but I'm asking you: Is it possible --
A I said yes, sir.
Q Thank you. And that's my complaint. Let's try to answer the questions precisely, if we can.
MS. MENDOZA: I'm going to object to the sidebar.
JUDGE WALSTON: I think he's answering as best he can.
MR. RILEY: Thank you.
Q (BY MR. RILEY) How many wells are you aware of that have been drilled to the lower Cockfield where there's been a direct pressure measurement? In the lower Cockfield. I'm sorry.
A Thank you for that clarification, Counselor.
The two that I'm aware of are on this exhibit I have in front of me. Excuse me. I'm incorrect.
The only one that I'm aware of is the TexCom well.
Q So your data set for determining the original pressure of the Cockfield Formation is limited to one data point. Correct?

925

A That's correct, sir.
Q What's the -- if I understand correctly, the numbers on the right-hand side of the page in a little box -- there's a little comment box, I'll call it, on Exhibit 102. There seems to be a number of depths, number of pressure measurements, and then a number of what I'll call gradient numbers depicted in that little box. Is that right?
A Yes, sir.
Q Did you cause those measurements to be made?
A No, sir.
Q Do you know who did?
A Halliburton measured them with an RFT tool under the direction of Wapiti.
Q Do you know when they were made?
A I'd have to go pull that log out again and look at the log header to see that date.
Q What depths were measured? Could you just run down the list for us?
A Do you want the range, or you want me to list each one, sir?
Q Just each one, please.
A Okay. 4940 -- and for the sake of brevity, I'm not going to repeat the decimal point numbers. I'm just giving you the round feet --

926

Q Thank you.
A -- if that's okay.
Q That's fine.
A 4970, 4981, 4988, 5078, 5140, 5210, 5294, 5310, 5366, 54 --
Q Going a little fast. I'm sorry. Let's go back. Here's what I have, and I'll go slowly for everybody.
4940, 4970, 4981, 4988, 5078, 5140, 5210. Have I gotten it right so far?
A You have, sir.
Q What's the next one after 5210?
A I'm sorry. 5294, 5310, 5368, 5437, and 5504.
JUDGE WALSTON: Just so I'm clear, this is the Wapiti well?
WITNESS HERBER: Yes, sir.
Q (BY MR. RILEY) Do you have any idea why those various depths were investigated with the RFT tool to get a pressure reading?
A They were trying to see what the current pressures were in the various producing reservoirs and look at the possibility of what the gradient was in the aquifer.
Q Okay. So 4940 had a gradient number, and all the depths that you've listed had gradient numbers.

927

Correct?
A Yes. And there's a trend to the gradient numbers.
Q Let's talk about that.
First, the top gradient number -- and I think you've given us, but give it to us again -- that correlates to the 4940 depth.
A .286.
Q And let's go down to the bottom, which I think is the 12th value, 5504, what is the gradient number in that test?
A The 12th value? You want the bottom one?
Q Yes, sir.
A It's .397.
Q And then the numbers that correspond to the other numbers are in -- are between that range. Is that correct?
A Yes, they're gradationally getting larger as you go down.
Q But they don't -- these are numbers that are adjusted for depth, are they not?
A That's the -- what you're doing by dividing the pressure by the depth.
Q All right. So they're adjusted by depth. So if the gradient were the same -- or the pressure were

928

the same at all the measuring points, we should get .286. Correct?
A Could you restate that question?
Q Sure.
I think it's your postulate that the pressure in the Cockfield Formation is equal; and no matter where you measure it, that's how you prove up communication, that it's .4 or -- and change. Is that right?
A No.
Q Well, okay. So I'm wrong, but let's explore a little deeper here.
The numbers you just reported to us for the top value at 4940 and the value at 5504, those numbers are clearly different. Correct?
A Yes, sir.
Q And I would assume, in this context, they are significantly different. Is that correct?
A They are.
Q So at 5504, adjusted for depth, the pressure is .397 psi per foot. Correct?
A Yes, sir.
Q And at 4940, adjusted for depth, the gradient number at that test was .286 psi per foot. Correct?
A Correct. Would you like an explanation why?

929

Q Somebody might, but I'm just pointing out the obvious, that the numbers are different.
A Okay.
Q Is that right?
My questions pertain to the -- first question I have is, why did they sample it? It looks like they weren't going down in increments. They being Halliburton. They were making jumps, say, from 4940 to 4970. That's 30-foot difference, 4970 to 4981 is 11 feet. Why were they making those particular adjustments as they went down the wellbore?
A The methodology for making these measurements is, first, you run your openhole log to -- especially your porosity log, so you have an idea of the porosity in the well as relative to depth. And so what you do, you lower that tool in there, and you set it at a depth where you're going to have some porosity.
You don't sample at shales, or you don't sample on tight sands. So some of it had to do with -- the sampling interval had to do with where they thought they could get a successful pressure measurement.
Q How --
A Halliburton was not choosing those points. Wapiti -- the representative from Wapiti was choosing those points.

930

Q Okay. And that's because they're looking for oil. Right?
A No. They're looking to see what the current pressure is. They're trying to understand the current reservoir conditions.
Q You don't think this well was intended to be a producing well, a well that was going to produce oil or gas or something of use?
A Yes, it was going to be a producing well, but they were trying to determine the current reservoir temperatures and pressures so they could understand the current reservoir conditions. Those conditions helped guide them in their -- in how they try to produce the field.
Q Well, that's my point, though, isn't it? I mean, the objective in drilling this well was to produce oil from the Conroe field. Would you agree?
A This well was -- besides being ultimately a producing well, was also a science well for Wapiti. They were trying to get information about what was the current status of Conroe field. I mean, in addition to running these RFT pressures, they ran VSP so they could tie the seismic data.
Q Okay. So this was an experimental well, just to see what was happening in the reservoir. Is that

931

correct?
A Correct.
Q So then it was important, then, to get accurate data. Correct?
A It was.
Q And the data shows that there is a difference in the psi per foot value in each of the tests that they did. Correct?
A Correct.
Q On the -- are there any markings, extraneous markings, other than the original data on the -- what do we call the one in the middle? On the exhibit? The well log in the middle of the page?
A The Manley (sic) well, sir?
Q Manley well?
A Or Madeley well.
Q M-e-d-l-e-y?
A M -- it's M-a-d-e-l-e-y, Madeley.
Q Madeley. Are there any notations on the Madeley well that were not there originally that were made by you or at your direction?
A Are we talking about the annotation for the different zones? Is that what we're asking?
Q I'm asking you, are there?
A There's some annotations on here that say, you

932

know, first main Conroe, second main Conroe.
Q Did you make those annotations?
A I asked Mr. McKenzie to put them on there.
Q They represent, then, as best you know, Mr. McKenzie's opinion about where the various sands are located, that he indicates?
A No. These are -- this is the type log, so these are -- these were determined stratigraphy for the Conroe field. This is what everybody -- this is what everybody uses for stratigraphy of the Conroe field because this is what was in the Railroad Commission unitization.
Q You're talking about the labels themselves, upper Cockfield, middle Cockfield. I'm asking you whether he found those in the well log and made the notations of where they occur in the Madeley well?
A No. These were already established.
Q All right. So there's no interpretation, then, required by Mr. McKenzie in determining where those sands occur based on the well log that's in front of you?
A That's correct.
Q What would you expect Mr. McKenzie's data source to be? Where do you find information about the Madeley well that set -- or explained the depth of the

933

various sands?
A The type logs in the unitization document.
Q Is there any pressure information, along the lines of what we're discussing, in the 2315D well as it pertains to the Madeley well?
A I don't understand your question.
Q Sure.
We just talked about pressure measurements in the 2315D well. Correct?
A Yes, sir.
Q Were any pressure measurements done in the Madeley well, to your knowledge?
A The Madeley well predated that technology that the Wapiti well employed.
Q So the answer would be no, then. Right?
A No, sir, there's none.
Q Was there a bottomhole pressure taken in the Madeley well?
A I haven't seen that well file. There could be at some point in time. I have no idea.
Q Was the -- when was that well drilled, if you know?
JUDGE WALSTON: The Madeley well?
MR. RILEY: Yes, sir. I'm sorry.
A I don't know sitting here, but I have it -- I

934

have the log with the header on it that I could actually tell you when that was drilled.
MR. RILEY: Can we take a minute just for the -- so we can get the record complete?
Q (BY MR. RILEY) Please.
MR. WALKER: Your Honor, excuse me, but as a longtime Conroe resident, the proper pronunciation of that well and that family is Madeley.
JUDGE WALSTON: Madeley.
MR. WALKER: With a long A.
MR. RILEY: Thank you.
A This well, according to the log header here that I have on this one-inch correlation log, was drilled in 9/63.
Q (BY MR. RILEY) September 1963?
A Yes, sir.
So that was the last run. That was -- excuse me. November of '63. I didn't see the fifth -- I didn't see the ninth run here. So the last run was down to a depth -- a total depth by the driller of 15,421.
Q Total depth 15,421 feet. Is that correct?
A Yes, sir.
Q Do you see anything in what you've -- what are you looking at? Is there an identifier of some sort?

935

Maybe it's a DEN number on that page?
A The common identifier here are API unit numbers, and I just annotated that on there, my log, by my own. And the API number is a -- depending on what data source you use, the first two digits is 42, represents Texas; the next three digits represent the county of Monroe (phonetic); and the last five digits represent the well. So it's a unique well identification system that's used by most people.
Q And I guess, for my purposes, since I don't have the body of knowledge that you do, is there a Denbury number on it so that I can find it in my records? Is it --
MS. MENDOZA: I believe that Mr. Riley is asking whether there is a production number on that. And if there is, it's going to be on the last page of it, at the bottom, and it'll say DEN something.
A I --
Q (BY MR. RILEY) Okay. I'll take a look at it at a break. That's fine.
A Okay.
Q Just keep it out, if you would.
A But this -- this is my personal copy, and the API number is 00480, which would be the last five digits. So if you were to want to buy a copy of this

936

log from somebody, that's what you need to know.
Q Does it have any information of the type that we've been discussing regarding pressure measurement in that well?
A No, sir.
Q That would have been drilled -- that was drilled through the lower Cockfield. Correct?
A Yes, sir. That's why it's on our cross sections.
Q Do you know if that -- is that well still in service, best of your knowledge?
A I have -- I don't know, sir.
Q In your prefiled testimony, on Page 3 of 13 -- just as a quick aside while you're looking for your testimony, did you prepare the question and answers in your prefiled testimony?
A I prepared the answers. The questions were already predetermined by Mr. McKenzie.
Q Okay. So you -- when you were asked to put together prefiled testimony in this case, you had a list of questions? Is that a fair -- or generalized way you went about preparing this testimony?
A I came into the setting rather late, as we -- you've already established. The questions were already established. I sat down on the very first time I met

937

Ms. Mendoza, and she went through the questions. And I answered them as truthfully as possible at that point.
Q Okay. I'd like to call your attention to your answer beginning at the top of the page, on Page 3 of 13.
And you said on Line 3, last sentence, in describing your experience, you said, "Most of this work has focused on reservoir exploitation, rather than exploration." Could you explain what you mean by "exploitation"?
A Usually, the geologists have their two end points in the profession. And some geologists do a little of both. And exploration usually uses sparse -- well-controlled sparse data sets to predict where a future field may be. They're usually high-risk ventures with high reward.
On the other end of the spectrum are the exploitation geologists who usually work inside known oil fields, usually involved in infield drilling projects or minor step outs from those known oil fields. They usually use a wealth of well information, a wealth of test information, a lot of -- they try to get their hands on basically every stick of information they can get ahold of.
Q Okay. My question is: What do you mean by

938

exploiting a reservoir?
A You're trying to get that last drop of oil and gas out of the reservoir. You're trying to make sure that you get it out as economically as possible.
Q And on Page 4, you use the word "exploiting" again in your answer beginning on Line 9, in the first sentence. You using that in the same context? Page 4.
A Page 4?
Q Yes, sir.
A Bear with me.
Q Line 9, your answer begins, in talking about the type of instruments used in your work and you talk about logs and cores. At the end, you talk about people with the company working on exploiting the oil and gas in a reservoir.
A Yes, sir.
Q Okay. And so that means not -- I guess that means not in the common word of exploitation -- or common use of exploitation. You're talking about squeezing every drop of oil and gas out of a reservoir. Is that right?
A With whatever technology that particular company is employing.
Q Is it -- is Denbury engaged, then, to use your terminology, in exploiting the Conroe oil field?

939

A We are currently producing it as is for probably the next five years while we put the infrastructure necessary for an EOR project, and that's shorthand for enhanced oil recovery. And we'll be using that CO2 technology to get the last economically recoverable oil with today's current technology.
Q Is that -- does that mean Denbury's engaged in exploiting the field, to use your terminology in your prefiled testimony?
A That's commonly -- exploitation is a commonly-used descriptor for people who do development work on a -- in an old oil field.
Q So let me ask you as directly as I can: Is Denbury exploiting the Conroe field, in your terminology?
A Yes, sir.
Q As I understand it, Denbury has a plan to exploit the field by -- through enhanced oil recovery with the injection of CO2. Is that right?
A That's well said, Counselor.
Q The plan -- best of your knowledge, have any of the activities planned been authorized or permitted by any state regulatory agency?
A No, sir.
Q You talk in your prefiled testimony about a

940

pressure maintenance program conducted by Exxon. This is on Page 10 of your prefiled testimony.
A Give me a minute, sir.
Q Sure. Take your time.
A I'm with you.
Q Discuss that with me, would you? What do you mean by a pressure maintenance program conducted by Exxon?
A I sort of alluded to it in my previous responses, and this was -- basically, the pressure maintenance was Exxon's attempt to stabilize the oil and gas context to prevent smearing of the oil into the gas cap and preventing a waste of the oil. When that oil goes into the gas cap, it goes into dead ends where it can no longer be recovered.

So once the -- once the field was unitized, they curtailed the production of gas from the Conroe sands, the two at the top, and tried to curtail the production from the rest of the field. Because Exxon basically found from doing volumetric material balance-type evaluations preunitization, that the gas was migrating from the lower Conroe sands to the Cockfield sands. That's why the Cockfield produced over 160 percent of its calculated volume. They also found through their calculations that oil from the second and

941

third Conroe was migrating up into the first Conroe. So what they're doing was by curtailing that gas, they were stopping the voidage of the gas to prevent the migration of the oil up into the gas cap.

The other thing they did was put large pumps to pump the water to try to lessen the bottom drive, the water drive, of the field, basically pushing everything upward. So basically, it's like a domino effect. The stuff at the bottom in the Conroe No. 6 is being pushed up by the water into the fifth and so on.

They ran, in those wells, a log called a pulse neutron. That's the generic term. Sometimes it's known as a TDT. That would be the Schlumberger's trademark name for that well. The atlas would be the PK100 and so forth and so on. But they ran those pulse neutron logs through time to monitor where the current contacts were, and they could -- prior to unitization, they could see that the oil and gas contacts were moving up gradually.

And then once they put this pressure maintenance plan in place, they stopped -- they were able to document that the contacts stopped moving upward and in some cases, actually expanded back down below where they were in that -- and from memory, I think in the -- either the SPE paper or the Journal of Petroleum

942

Technology paper, they stated that they actually arrested the movement of the contacts within a short period of roughly three years.
Q I'm imagining an English muffin. Some of the reason is I didn't have breakfast. But the other reason is in discussing the bottom of the Jackson shale, if I used the term "nooks and crannies," is that what Exxon was trying to prevent, that the oil would move up in the formation into nooks and crannies and be in little or smaller pockets and could not be produced effectively. Is that right?
A That's a very good analogy.
Q And with the gas cap in place, it would keep the oil below the nooks and crannies; and, therefore, you could have fewer wells and produce from larger pockets. Is that a fair characterization, too?
A I don't know if it's -- if it's fewer wells, but you're just preventing the waste from that stuff getting into those pockets, as you will.
Q All right. The -- and as I think you described, Exxon had rapid success with pressure management in the way you've just described. Correct?
A Yes, sir.
Q Was that through the sands, the producing intervals that we discussed earlier? In other words,

943

did they get the same benefit at each of the sands, to the best of your knowledge?
A To the best of my knowledge, that seems to be a true statement, but I'm relying on those two papers for my understanding.
Q So we know, at least, that in the -- based on your testimony, at least, that in the producing intervals or stratum that Exxon was aware of at the time of unitization, the -- that there is communication. Is that right?
A In the upper Cockfield, that's what's demonstrated by the production information.
Q And that tells us about the upper Cockfield. Correct?
A It has implications to the middle and lower Cockfield, also, Counselor.
Q Okay. And that may be true. But what it really tells us is about the upper Cockfield, and there may be interpretations beyond that. But the direct data is about the upper Cockfield. Correct?
A Well, I'm thinking, sir.
Q Take your time.
A Conventionally, in a field that's been portrayed as a waterdrive field, not a pressure deplete field, the basic premise is that it's connected to the

944

an aquifer. And the basic premise here at Conroe is that the whole Cockfield is one aquifer. I mean, it's all one. That was -- when you're modeling the aquifer at Conroe, you would conventionally include the middle and lower Cockfield in your calculations.

Your question that you asked me, the production disproves that the upper Cockfield's all in communication, if you want to be absolutely, totally accurate.

Q That's my ambition.

A I understand. But most people in the oil and gas business would, by convention, include the whole Cockfield as one unit.

Q Well, that's interesting to me because the whole Cockfield is not unitized. Is that right?

A By convention, you only unifies -- you only unitize the productive interval.

Q And on what do you base that statement?

A Actually, I base that on all the units I've ever been involved in, including, you know, the most recent attempt to try to unitize Oyster Bayou.

Q Well, as we talked about earlier, it's really carving up the pie. That's, at least, a central purpose of unitization. Correct?

A Correct.

945

Q And if there are nonproductive intervals or stratum, you would not expect to share a piece of pie with owners of those minerals. Is that -- or lack of minerals. Is that right?

A That's correct.

Q And that's one possibility. Is that right? That's one possibility, is that there's no production out of those intervals, so why carve up the pie with those folks. Correct?

A Correct.

Q Well, is there another possibility that they're not in communication, so, therefore, there's no reason to consider those other stratum as part of a unitized area?

A That requires a leap of faith, I guess.

Q Sure, as with most things.

But it's possible, right, that if there's not communication to another stratum, you wouldn't want to carve up your pie with those noncommunicative interests. Is that right?

A Let me back up.

The original piece of the pie was the original oil in place. That's what people are inventorying. That's what we're dividing up. We're -- no one's dividing up the nonproductive interval.

946

Q But --

A The dynamics of the reservoir are not what you're dividing up. You're dividing up the oil in the pore space.

Q Was there a productive interval or stratum above the Jackson shale in the Conroe Formation?

A There are.

Q So there's oil and gas above the Jackson shale. Correct?

A I believe there's some Frio and Catahoula production.

Q That is, would you agree with me, clearly separate from the Cockfield Formation? Would you agree with me?

A That's correct.

Q Okay. Were those unitized -- were those operations unitized by Exxon?

A There were multiple operators of the shallower production, and they weren't unitized because there was no compelling reason to do them. There was no -- if I did something as a unit, I wouldn't have enhanced production.

Q Well, it's separate. Right? It's separated by a thousand-foot shale layer. Correct?

A Correct. But they're --

947

Q So it's a different pie. Is that a fair statement? Yes or no?

A It's a different reservoir.

Q A different pie to carve up. Correct?

A There have been no demonstration geologically that the shallower formations were interconnected like the Conroe.

Q How do you know that, sir? Have you investigated that point?

A Me personally?

Q Yes, sir, you personally.

A No, sir.

Q All right. So you don't know that answer. You're just making that up. Correct?

A I'm not making it up, Counselor. That's just been my experience, that the Frio is very stratigraphic at that depth.

Q Be that as it may.

Is one of the reasons that it wasn't included in the carving up of the pie in the Cockfield Formation, is it's not in communication? Is that one of the reasons?

A That's correct. It's separated by the Jackson shale. It's not in communication with the Conroe unit.

But --

948

Q There's no question before you, sir.
A Thank you.
Q Is the purpose of CO2 injection to increase reservoir pressure?
A They -- as we explained before, you have better results if you increase a reservoir pressure.
Q My understanding of what you said a moment ago is that the ambition of Denbury is to pressurize the Cockfield Formation to native pressure, original pressure. Is that right?
A That's our proposal, yes, sir.
Q That's the entire Cockfield? Based on your testimony, since it's all in communication, you need to pressurize the entire Cockfield Formation to have a successful CO2 injection. Is that right?
A That's correct.
Q Have you calculated the volume of CO2 that would be necessary to return the Cockfield back to its original virgin pressure?
A I haven't.
Q Why is it necessary to inject CO2 into different stratum, as is Denbury's plan, to pressurize the Cockfield the way it will exploit the resource?
A I don't know if that's been decided, Counselor.
Q Well, you would expect Denbury to have told the

949

Railroad Commission the truth when it went there, wouldn't you?
A I would expect so, yes, sir.
Q All right. And you were in those meetings at the Railroad Commission, correct, when they were -- when Denbury went into the Railroad Commission to explain its ambition regarding the Conroe field?
A I was in one of the meetings, sir.
Q And in the meeting you were in, did not Denbury demonstrate that it intends to inject CO2 into different stratum in the Conroe field?
A I don't recall that, sir.
Q Perhaps somebody else will.
MS. MENDOZA: Objection to the sidebar.
JUDGE WALSTON: Yes.
MR. RILEY: I apologize. I apologize.
Q (BY MR. RILEY) If it is true, why would it be necessary?
A Excuse me.
Q Sure.
A If it is true, it would be to do it in a faster form. In other words, the sooner we get it in there, the sooner we can start going the other direction.
Q How many wells need to be drilled to accomplish Denbury's plan of CO2 injection for enhanced oil

950

recovery in the Conroe field?
A That's to be determined, but roughly -- you don't -- until we do the inventory of the current wellbores, their mechanical integrity and their stability and so forth and so on, we don't know how many wells exactly will be drilled.
Q Well, assume there's a plan for injecting CO2, are you familiar with it?
A The planning is still in the very preliminary stages. The planning has not gotten to the -- what I call the cast in stone.
Q Well, is it possible, then, that the plan might not be advanced?
A No. No.
Q It's not possible?
A We've gotten too far down the road to go backwards.
Q What do you mean by that, sir? What do you mean you've gone too far down the road? You hold no authorizations for any injection, correct, of CO2?
A Let me -- can I place my comments in context?
Q Well, I want to know what you mean when you just answered a moment ago that you're too far down the road to turn back. What do you mean, sir?
A Well, we've purchased the field from Wapiti at

951

great expense. We've made that public knowledge of our intent to flood the field. It's been portrayed in our annual report, Denbury is the sort of company that follows through on its promises to the shareholders.
Q Are you a shareholder in Denbury, sir?
A I am.
Q The promise to shareholders -- would you agree with me that the first promise to shareholders is to make money for the company? Would you agree with that?
A That's every company's promise to their shareholders.
Q Well, is it Denbury's promise to its shareholders? You're a shareholder, aren't you?
A It's Denbury's promise to every shareholder.
Q And the promise to the shareholder is for the company or the venture to be profitable. Right?
A That's what every company wants to do.
Q Okay. I'm asking about Denbury. And you can tell me about every company, which I find surprising you know the ambitions of every company, but I'm asking about Denbury. Is that its ambition?
A Yes, sir.
Q So even if the price of oil were to drop such that an expenditure in the Conroe field is no longer financially viable, you would expect Denbury to keep its

952

commitment. Is that your understanding?
A That's the risk of this venture, yes, sir.
Q So Denbury, regardless of where it was in the process, if the price of oil doesn't justify the expenditure, it would continue to exploit the Conroe field at a loss. Is that your understanding?
A No, sir.
Q So it would stop?
A It might curtail its operations.
Q Till it was profitable. Would you agree?
A That's probable.
JUDGE WALSTON: Mr. Riley, we are tight on time, and I think we've gone down a rabbit trail here. We need to get back onto the point.
MR. RILEY: Thank you, Judge. I think credibility is an issue in every witness's case.
MS. MENDOZA: I'm going to object to the sidebar about the witness's --
MR. RILEY: I was responding to the judge, Counselor.
MS. MENDOZA: -- credibility.
MR. RILEY: Just give me a minute, if you'd allow me, Judge. Thank you.
(Pause)
MR. RILEY: Just have to flip through

953

these flags, and I'll be done.
JUDGE WALSTON: No problem.
MR. RILEY: As I flip through them, let me ask the questions I have forgotten as I went through.
Q (BY MR. RILEY) Mr. Herber, the -- when I interviewed you, so to speak, in the deposition on May 20th, I asked you what testimony you had reviewed in this case. And your answer was you didn't have time to review it all.
Have you reviewed all of the testimony that bears on your testimony, namely the other geologists' testimony in this case, at this point?
A I read some testimony by Phil Grant and Dr. Langhus.
Q Did you read all the testimony, as far as you're aware, of those individuals that pertains or is in the record in this case?
A At least once of those two guys, those two gentlemen. Sorry.
Q That's okay.
The testimony of Phil Grant, then, you're familiar with his opinion regarding the transmissivity of the 4400-foot fault?
A Yes, sir.
Q And Mr. Grant's testimony, were you here when

954

he said it is his opinion that the fault is non-transmissive?
A I was.
Q Do you think he's wrong?
A He is, in my opinion.
Q Did he seem to you to be a careful man?
A He's a very careful man.
Q Okay. So do you think he's just missed something that you've discovered in the approximately two months that you've had to review the information relevant in this case?
A The difference between Mr. Phil Grant and myself is, he's basically an environmental geologist with expertise in hydrology. He doesn't have my expertise in depositional systems. My thesis was basically to describe the depositional systems of the whole scene in the Rio Grande area, so I was looking at the interrelationship of the fluvial and deltaic and lagunal and barrier island system. So I understand depositional systems a little more closely than -- or a little better than Mr. Grant.
Q Have you -- I'm sorry. Are you finished?
A Yes, sir, I am.
Q Have you spoken with Mr. Grant?
A No, sir.

955

Q Do you know his background?
A That was -- that's my opinion, based on his testimony.
Q Oh, I'm asking you a different question, though.
Do you know anything about Mr. Grant's work history?
A Part of the documents show his resume.
Q And you're saying he's a different breed of geologists because he's involved in environmental permitting? Is that what you're saying?
A He has different skill sets than myself.
Q Okay. He can read a fall-off test. Can you?
A No, I cannot.
Q He's been working in the field for about the same amount of time, I believe, as you have. Are you aware of that?
A Yes, he has.
Q You just think you're better qualified to interpret information in this case than Mr. Grant?
A No. My expertise lay in depositional systems, and I don't think Mr. Grant's do.
Q But you don't know his background, do you, sir?
A Well, from his resume.
Q Okay. But have you looked at any of the files

956

that he's reviewed, any of the applications he's presented to any regulatory authority?

A I'm basing my opinion on his testimony here.

Q When you use the phrase "tortuous route," what do you mean? I think you used that in cross-examination by Mr. Walker, but you also used it a few times in your deposition.

A Yes, sir, I did.

Q In this context, then, what do you mean by "tortuous route"?

A How would you like me to illustrate my comment?

Q Well, I would prefer you describe what you mean verbally, but if you have some other means, interpretive dance or something else that you'd like to use, please --

JUDGE WALSTON: Mr. Riley, let's don't make sarcastic remarks.

MR. RILEY: I'm sorry.

JUDGE WALSTON: Perhaps if you'll read in the entire statement that's in the deposition, to put it in context.

MR. RILEY: Sure.

Q (BY MR. RILEY) Do you need to draw? Is that what you're suggesting?

A No, sir. I'm just -- I'm -- the tortuous route

957

in relative to the waste or the CO2, or what are we talking about?

Q Well, I thought you had answered Mr. Walker's question -- let me see if I can find it in my notes. I thought it pertained to the waste.

A Okay.

Q Is that right?

A Okay.

Q But I don't want to put words in your mouth. Is that right? You referred to a tortuous route. Were you talking about the waste at the time you were answering that question?

A We can answer it in that context, Counselor.

Q Okay. Thank you.

A When the waste were to leave a set of perforations at their well, it would intersect different depositional sands. From the well log, you can't tell who's who exactly. The only way you would -- may be able even to make an interpretation of what the different depositional sand packages is if you were to have core where you could see sedimentary structures and so forth and so on. So it's purely conjectural as to what depositional system using those sands without making individual sand maps and having an idea of the sand body geometry.

958

So just on a probability basis, because we're in a deltaic, fluvial, shoreface environment, some sands will have channels in them. Some sands will have inter-channel sands. They have various grain sizes.

The channel sands typically have larger grain sizes; therefore, they have larger pore throats and, therefore, larger, better permeability. Those channels present a highway, if you will, for the fluids to move. Those highways would have a chance to intersect faults and fractures smaller than the resolution of our well control and/or seismic data.

Just by the setting we're in, we know we have a spectrum of faults and fractures. In fact, the small faults are probably more common than the ones that we've identified to date. They would hit those faults and fractures and go up because of the transmissibility of fractures is higher than the permeability of most of the sands. Then we might reach a point where it hits something that would make them vertical transmission and cause a path to change to -- back to horizontal.

If they intersected a large fault, like the 4400-foot fault, that's not really a one-fault plain. It's not just like a piece of paper. It's a series of breaks, and it's actually a zone that has some width. It can be -- depending on the throw of the

959

fault, it could be tens of feet wide. It's looks like -- if you were on an outcrop, you would see this thing as being a very fractured, rubblized (sic) zone that could be several feet thick.

What happens when a fault is generated, the sands break first because they're more brittle and the shales tend to absorb that stress. And so what you -- it's like breaking a set of pencils. Okay? When you break a set of pencils, they don't break at the same place and point. Okay? So the fault is not actually a smooth plane, but it's a zigzaggy sort of thing. So even if it were able to reach a major fault, the path would be very zigzaggy.

So for the vertical transmissibility and horizontal transmissibility, it just goes where the best permeability opportunities would present itself.

Does that make sense to you, Counselor?

Q It does. Sounds like a tortuous route from waste placement to any other point in the formation.

A Correct.

Q And you would need a number of interconnecting highways. Is that correct?

A That would be a -- I would like that word, yes, sir.

Q Okay. So we can use highways. We could also

960

use rural roads or streets. I mean, highway suggests speed. Is that right?
A Yeah, there are -- you're exactly correct. I like that. There are some avenues. There would be some back roads. There would be some rural roads. I mean, it's --
Q Do you know the phrase or the expression "You can't get there from here"?
A I've heard that phrase, yes, sir.
Q Okay. One of the metaphors, analogies that's been drawn by other experts in the case is a layer cake, with the cake part being the sand and the frosting part being the shale. Have you seen any of that testimony?
A Yes. In fact, you brought it to my attention during my deposition.
Q You know, in another deposition, I actually had a layer cake in the room and got to do a live-action reproduction?
A In all, Counselor, I actually like that analogy. It's a very good analogy.
Q All right. So I think Mr. Grant's interpretation of events is that the shale in the Cockfield Formation would create barriers, particularly at the 4400-foot fault, because of smearing.
A Yes, sir.

961

Q All right. So some of the these highways might be closed off. Is that right? Might be a detour sign there?
A That's exactly right.
Q All right. So would you agree with me, then, Mr. Herber, that one has to do a good deal of speculation to find a path from where TexCom purports to -- or will put the waste or proposes to put waste before one would reach any producing well in the Denbury fleet?
A No, sir.
Q All right. And that's because you have evidence of these highway connections. Is that right?
A No, it's a probability assessment.
Q All right.
A Based on the setting.
Q And the setting, as you see it, then, is a high probability. Is that right?
A Based on the setting that we're being in a salt tectonically area and a fluvial deltaic setting.
Q Right. And you heard -- did you hear the discussion of fall-off test? I know you can't interpret them, but did you hear the discussion with Mr. Grant about his interpretation of the fall-off test?
A I don't believe I was present there at that

962

point.
Q Okay. Well, let's speculate with me, then.
Let's suppose he has speculated or has opined that it's a low permeability zone, and the fall-off tests have indicated low permeability in the order of -- well, Mr. Grant's latest opinion is 48.68 millidarcies. A prior investigation, I think lead by Mr. Fairchild seated behind you, one of the Denbury witnesses had 80.9 as the permeability. Can you follow that so far?
A I can.
Q All right. Do you know of any discovery from any direct testing of the WDW -- WDW410 that would indicate any of these highways exist around that well?
A There's -- as Mr. Grant alluded to, there was a -- in his questioning, there was a little bit of departure at the very tail end of that test that could indicate something that would be -- have a different permeability than the rock or immediately around the well.
Q So you were here for that part of the testimony?
A I heard that.
Q Okay. You heard that. Did someone tell you that, or you were in the room for that?

963

A No, I actually heard that, yes, sir.
Q Okay. Do you understand that that is something that occurs in every fall-off test at the end of the test, that there's a period of data fluctuation that's unreliable? Do you understand that or not?
A That's -- what happens at the end is interpretive.
Q Well, I understand what you're saying. But you have no ability to interpret a fall-off test. Is that right?
A That's correct --
Q Okay.
A -- Counselor.
Q So this data means nothing to you, in your skill set. You can't interpret it one way or the other because you don't do that. Is that right?
A That's correct.
Q So leaving that aside, then, do you know of any evidence of any highway, rural route, street that would indicate a pathway even to the fault from the TexCom WDW410?
A The seismic evidence that I looked at.
Q In your deposition in describing the tortuous path, you called it a very tortuous path. Is there any difference in your mind between very tortuous and

964

tortuous?
A That's -- you know, that's subjective, sir.
Q Quick question: Back on the pressure values that you've reported to us from Exhibit 102, do you consider those pressure values to be very similar? By that, I mean the psi per foot.
A And we're talking about in the Wapiti well. Correct?
Q We're talking about in the Wapiti well. Yes, correct.
A Okay. And your question is, sir? I didn't -- would you rephrase it for me, please?
Q Yes.
We discussed, at least, to some degree the basis for your opinions in this case during your deposition, and you referred to the Wapiti well or the data from 2315. And you said that there were -- and I'll be happy to read this to you, if it's necessary, but you said that the measurements were very similar in the Wapiti well.
A The bottom -- excuse me -- the bottom measurement at 5404, when you go through the division of the pressure versus the depth, you come up with a number that's .397. When you go through that same exercise in the Crossroads well, with that one data point there, you

965

come up with a .406. Those numbers are very close.
Q But they are different. Right?
A They're slightly different.
Q How about between the .29 -- I think it's .296 or .286? The first value, .286.
A Yes, sir?
Q Is that very similar to .397?
A No, that's different.
Q Different in a significant way?
A It is.
Do you want the explanation?
Q If I did, I would have asked you, sir.
A Thank you.
MR. RILEY: Thank you. Pass the witness.
JUDGE WALSTON: Executive Director?
MS. GOSS: No questions for this morning. Thank you.
JUDGE WALSTON: Why don't we go ahead and take -- we've been going almost another hour-and-a-half. Why don't we go ahead and take a short break. We'll resume at 11:20.
(Recess: 11:06 a.m. to 11:23 a.m.)
JUDGE WALSTON: Okay. We'll go back on the record.
Ms. Mendoza, I assume you have redirect.

966

MS. MENDOZA: Yes, we do. Thank you.
JUDGE WALSTON: I notice Mr. Walker is not here. Is that okay?
MS. FORLANO: That's fine, Your Honor.
REDIRECT EXAMINATION
BY MS. MENDOZA:
Q Mr. Herber, your study of geology didn't begin on April 28th of 2010, did it?
JUDGE EGAN: I can barely hear you.
JUDGE WALSTON: Yeah. I was about to say --
MS. MENDOZA: I'm sorry.
JUDGE WALSTON: -- you need to pull that microphone --
MS. MENDOZA: I'll get right up to the microphone.
JUDGE WALSTON: -- closer to you.
Q (BY MS. MENDOZA) Mr. Herber, your study of geology did not begin on April 28th of 2010, did it?
A No, ma'am.
Q How long have you been working in the field of geology?
A As an oil and gas professional, 28 years, and there's been some prior non-oil and gas experience before that. So that would push me into the 35-year

967

range.
Q Okay. And you hold both a bachelor's degree and master's degree in geology. Correct?
A I do.
Q What was the topic of your master's thesis?
A I briefly mentioned it before. It was the whole of seeing sediments under -- in Cameron County. That would be the southernmost county in Texas, so it would be discussing the depositional systems of the Rio Grande River and its delta, Padre Island and Laguna Madre.
Q And is that depositional environment similar to the one that we have here in Conroe?
A It would be a very close analog. And, in fact, Mr. Grant in his testimony mentioned it as being an analog.
Q Have you worked in other oil and gas fields that are similar in its depositional environment to the Conroe field?
A Not only similar in a depositional environment, also similar in the structural setting. One of my responsibilities in Chambers County is Fig Ridge, and it's also -- Fig Ridge, just like the tree. And it's in a very similar setting.
I also worked Hastings Field, which in --

968

even in the documents by the AAPG, they cited Hastings as being a very similar-type field. And then I've worked other salt domes; one in Mississippi called Martinville and one in Brooks County, Texas, called Gyp Hill. So I've had a lot of direct experience in working salt features.

Q And since the time that you filed your prefiled testimony, have you done more, and have you continued to look at the geology of the Conroe field?

A I have.

Q And has anything that you have seen in the time since you have filed your prefiled testimony made you think that anything in your prefiled testimony is incorrect?

A No, ma'am.

Q Mr. Riley called your attention to one statement that you made during your deposition about licensure being a marketing tool.

Did you in any way meant to disparage people that hold licenses as professional geologists or as licensed geologists?

A No. That was not my intent at all. It was in the context of what was good for me personally. I have worked for companies, and most companies have a staff of people that are qualified to determine if you're a

969

credible geologist or not and have the professional expertise to perform the job.

There's definitely a place in the state of Texas for the licensing process because there are certain needs for geologists who will be working for companies that don't have the internal expertise to determine if that individual is competent. So it does serve a distinct and very beneficial purpose for the state -- citizens of Texas.

Q We've talked at some length about the unitization, and I just wanted to be clear that on what you had reviewed that related to the unitization and how that was prepared.

Can you explain what unitization-type documents you had reviewed?

A I don't think I actually reviewed any actually unitization documents.

Q Did you review some of the technical subcommittee documents?

A I looked at some of the technical documents.

Q Okay. And were those the documents that were prepared by some of the companies that were operating in that field?

A It was.

Q Is it your understanding that these companies

970

came to a consensus on the field's, sort of, geology and how it was working together with that geology?

A That's the basic premise of forming a technical subcommittee, is to arrive at a technical consensus.

Q I want to -- you had referred to, I think, depositional facies when -- in some of your answers, and I wanted to make sure we all understood that.

What is a depositional facies, in a fairly simple explanation?

A I guess the simplest way to demonstrate is to talk about examples.

If you look at the current Texas coast, there -- it's comprised of rivers and deltas, bays, estuaries, barrier islands, shoreface, those are the near shore facies. And some of those facies have sub-environments; like, for example, the delta has a distributary channel in it, and then there's inter-distributary muds and and inter-distributary bays, so they were between the channels.

These facies have different shapes, as far as size. There's a probability range of what they would look like, if you were to find them in the subsurface based on what's going on in the current surface. So basically, the -- what's going currently on process wise is our analog as geologists to -- for what would be

971

realistic in the subsurface, as been stated earlier, we can't see down 6,000 feet, so we have to use models for analogs or data from other fields as analogs.

Q So if I understand you correctly, then, years ago, in geologic time, the Conroe was essentially on the coast and like some of these coastal features you're describing?

A Yes. It had -- it's very easy to see from the one core that Exxon took in the 2720 where they had some sedimentary structures that you could use to infer what the different facies were; and, in fact, that's what -- Exxon generated a report and also Core Labs generated a report making an interpretation as to what different facies were.

They chose -- the Core Lab people chose to use deltaic facies to describe the core whereas the Exxon people, due to some other criteria, chose to portray them as a lower shoreface, lagunal and some deltaic and fluvial. So they had a little more sophisticated, more complicated interpretation of the core. But that interpretation comes from the rock, not from any of the electric logs that we're talking about.

Q Okay. You had talked some about the core, and I think you had answered about the core somewhat in some of your earlier answers. And did you look at the core

report or the portions of core report that were found in TexCom's application?

A I did.

Q And were you here when Mr. Casey testified about the core report?

A I was.

Q Do you remember the testimony about what was the composition of the last or the fifth sample that was taken from that core report?

A Yes, I heard that. And it -- the core report showed a certain size of millimeters, .1, I believe, and that puts it in the sand range. So it couldn't be a shale as portrayed by Mr. Casey.

Q Did you believe the readings that were taken off of that core report for that particular sample were outliers?

A No. And the purpose of that crossplot --

MR. RILEY: Objection. This is new testimony. This isn't anything I raised on cross-examination. This attempted bolster prefiled testimony.

JUDGE WALSTON: How does this relate to the cross-examination?

MS. MENDOZA: Well, one, I believe there was a lot of discussion about permeability and about

transmissivity of which permeability is a part. The core report is directly about how permeability was determined and what we should be expecting for permeability in the lower Cockfield, and I believe that was actually a pretty substantial portion. And then I believe one of Mr. Herber's answers in the earlier part did reference the cores information.

MR. RILEY: Well, first, the transmissivity questions were very well isolated to the fault area and the transmissivity of the fault. There were some other questions about whether he heard certain testimony of other witnesses on permeability, which he denied listening to all of Mr. Grants' testimony.

Certainly didn't go into core -- this is clearly counsel trying to now raise issues that she raised on cross-examination of Mr. Casey with this witness. It's not related to the cross-examination. Sure, we're talking about geologic stratum and apparently this testimony would relate to geologic stratum, but it's not on the -- in the scope of cross-examination.

MS. MENDOZA: There were -- there was a lot of testimony about the tortuous path and how things moved through there, and this is all about how things move through there. It was the testimony went well

beyond the transmissivity and the permeability of the fault. There was a long discussion about highways and how it moves and --

JUDGE WALSTON: Refresh my memory again. Now, what is your question to him?

MS. MENDOZA: The question is about the core report and about whether that data is an outlier such that we should adjust how the curve is moved so that you get a different permeability and, thus, a different transmissivity of the stone -- of the rock formation in the lower Cockfield.

MR. RILEY: It's so far afield from what I asked about -- the tortuous pathway was the phrase this witness used in response to a question from Mr. Walker. I asked him about the pathways. I didn't ask him about permeability. I actually -- I'm not sure I asked him any questions about those pathways as it pertains to the Conroe field or the area around the well. I was trying to understand his terminology.

Now we're going back to whether evaluation of certain data sets was appropriate -- Mr. Casey's evaluation of certain data sets was appropriate in this witness's opinion. It's clearly not related to the cross-examination.

JUDGE WALSTON: We'll sustain the

objection.

Q (BY MS. MENDOZA) Mr. Herber, there was -- I do want to clear up one thing. There was some testimony that Mr. Riley had -- some questions that Mr. Riley had asked you about, and it was about the Exxon pressure maintenance program. And I just want to make sure -- I think there was some confusion about the naming of the sands, and you had talked about some sands that had gas in them.

Do you -- what are those sands called that have gas in them at the very top of -- I guess somewhere above the -- what TexCom has defined as the upper Cockfield?

A They're called the Cockfield sands.

Q Okay. And is that where the -- there was gas production from there?

A Well, no oil or gas production. There was a thin oil rim on the very outer reaches of the field.

Q Okay.

JUDGE WALSTON: Can I ask a quick clarifying question because I was confused on this earlier.

So are the Cockfield sands within the upper Cockfield?

WITNESS HERBER: They should be.

976

JUDGE WALSTON: Okay.
WITNESS HERBER: When you drill through the Jackson shale, it appears to be mainly black and gray shales by color. Those are symptomatic of deeper water marine shells. They tend to be more plastic, as a rule, and have higher capillary entry pressures.
The sand -- the shales that are deposited within the Cockfield, because they're encased in a setting, fluvial deltaic tend to be more proximal than distal. Therefore, they have slightly different characteristics. The --
JUDGE WALSTON: I think you've answered my question.
WITNESS HERBER: Okay.
JUDGE WALSTON: That's good. And I mean, but to clarify again, there was some reference to Conroe sands. Are the Conroe sands the same as the Cockfield, or are they above or below these Cockfield sands?
WITNESS HERBER: They're -- by paleontology, they're all part of the Cockfield.
JUDGE WALSTON: Okay.
WITNESS HERBER: And by shale color, also. That's what I was trying to get to. I'm sorry.
Q (BY MS. MENDOZA) I think that we had -- can you see on the TexCom logs these gas sands that

977

everyone's talking about up at the top?
A Yes.
Q Do you have one of the TexCom logs there that maybe we could look at and we can make sure everybody understands where it is?
A In the -- on the 5-inch log of TexCom's.
Q And I think is there like an exhibit written on this? Is this like part of Exhibit 11?
A It would be Exhibit 11, Page 120 of 270.
Q What can -- can you see -- can you tell us -- when you say these Cockfield sands, at what elevation are you calling those sands in that particular well log?
A In the TexCom well, originally Crossroads Environmental WD315, the top of the Cockfield itself would be roughly at 4886 or something like that. That -- the -- there's -- the Cockfield sands are very stratigraphic, and they come and go. There's one Cockfield sand present in this log. It is productive. It has some hydrocarbon in it. I can't tell you whether it's oil or gas from this log. It's at the depth at -- roughly 4987 is the top of it, and it's approximately somewhere between 10 and 11 feet, depending on how you want to -- where you want to use your cut off.
Q Ten and 11 feet thick?
A Yes, ma'am.

978

Q And then what's immediately below that? What kind of rock do you have below that?
A There's more Cockfield shale, Cockfield age shale; and it's till you get to the first main Conroe sand, which would be at 5176, something like that. The difference between the base of this Cockfield sand at -- the base of it's 5,000. So basically -- you're looking at, basically, well over 150 feet in round numbers of shale between the first main Conroe sand and of this Cockfield sand that's productive.
Q And what did the Exxon pressure maintenance program tell you about the communication across that 150-foot of shale that we just talked about?
A Because it produced more than it could volumetrically hold, then it basically implied that the gas that was being produced was coming from below, being transmitted up faults or fractures or failures of some of the artificial penetrations. In some cases, it could be juxtaposition, but the probability of that is fairly low because the slender nature of these sands and the fact that they're highly stratigraphic come and go. So the highest probability for avenues of migration would be the faults and fractures that would be expected in this geologic setting.
Q You went through a long discussion with

979

Mr. Riley and some with, I think, Mr. Walker about the faults and particularly about the 4400 fault I wanted to ask you about.
Do you believe that that fault is transmissive in the horizontal direction? In other words, fluid from one side of the fault can move to the other side of the fault in the area of the lower and middle Cockfield?
A Once again, that answer is, "It's variable." It can -- it could be transmissive in some parts and it could be non-transmissive in others. And if I may be permitted, I'd like to explain why I'm giving you a range there instead of a "yes" or "no" or a "It's that way" or "That way."
Q If you can tell me, why do you think it is variable?
A It goes back to that shale smearing issue. When you try to evaluate the shale smearing, what you do is you look at the throw of the fault -- in other words, how far does the fault throw -- and then the summation of shale in the interval. And they've empirically found that if you have less than a net of 20 percent roughly shale that the shale smearing is not effective in sealing the fault.
But even with a little bit of shale, just

980

like Mr. Riley used, the cake analogy, if you were to slice a cake, that first little bit where you slice down is going to have a little bit of that shale smear into it. So if you're right near right below the base of that frosting, i.e. the mud, or the shale, it would cover that, but when the shale sort of ran out, it would be open; or another analogy that I like to use, if you were to take a piece of chalk and say that's equivalent of shale and draw a line on the sidewalk, at some point you'd run out of chalk.

So that's why the throw of the fault versus the thickness of the shale just sort of determines the -- and you can make that into a formula, and it's called the "shale gouge ratio method." So you can sort of put a numerical value to the sealing possibilities, if you will, on the shale smearing.

With the Cockfield Formation being dominated by sand, the shale smearing mechanism is present but varying in a low percentwise. And there's a clearly unbiased data point in their well.

They had a mud logger who logged the section. And basically what they're doing is they're looking at chips of rock that come up from the drilling when they're drilling the well, and he's putting a value of how much shale is here, how much sand is here. And

981

he basically came up with there's roughly 15 percent shale in the Cockfield. He also picked the top of the Cockfield the same place TexCom did because they didn't see those little skinny sands up in the Cockfield. So the mud logger was basically characterizing the same interval that TexCom is using to be their, what they're calling, Cockfield interval. So they came up with basically 15 percent. So the shale smearing mechanism that Dr. Phil Grant used in his testimony is intermittent.

Q And do you believe that at the 4400 fault, the lower Cockfield is completely sealed off?

A No. The ones that have -- the part of the Cockfield that has the greatest probability of being sealed by shale smearing would be the very upper Cockfield because it's being juxtaposed against the Jackson shale. And so when you're netting the amount of Jackson shale versus the amount of throw there, it's almost 100 percent, whereas when you -- at the lower part, you're having 30 and lesser feet of shale being smeared, and it just runs out, like the piece of chalk on the sidewalk or the frosting on the cake.

Q Now, in terms of vertical transmissivity at the fault, do you believe that the 4400 fault is vertically transmissive?

982

A I do.

Q Can you explain sort of why you believe that the fault is vertically transmissive?

A There's a thin line between fractures and faults. The thing is blurred, if you will. The only distinction between a fracture and a fault is that the fault has movement so that there's some offset. They basically are both cracks in the subsurface.

When we're talking about the permeability from core samples, you see a large range, and that's just -- that's natural. You should expect to see that large range. You should see the lower end, less than ten millidarcy to darcy rock, which is a thousand millidarcies.

That's just like, for example, the depositional system. You should expect that natural variance. For example, distributary channels, which should have the higher end, the inter-distributary area should have the lower end. So you should expect to see that.

When you're -- I lost my train of thought.

Q I'm sorry, I think I may have lost it as well.

We were talking about the vertical transmissivity and what evidence you had that there are -- why do you believe that the 4400 fault is

983

vertically transmissive; in other words, that fluids would move up the fault?

A Okay. But anyway, there's a variance of permeability, but the best permeability you would see in that rock -- thank you, Counselor -- the best permeability you see in that rock is somewhere in the darcy range. That's the upper end. Even in the upper Cockfield where the hydrocarbons preserved porosity and permeability -- and I can expound on that, but not at this point -- the best you should see is maybe one and half darcies. Okay? If you have a fracture that's a width -- let me back up.

This piece of paper here is 400-microns thick, just for scale. If you were to take something roughly half that thickness -- and I'm using the number 254 because I've done -- can do the calculation easier, if you take that -- it's basically half the width of this piece of paper -- the permeability of that would be 54 darcies; in other words, 54 times the best rock we have in Conroe.

So faults and fractures are highly transmissive where those fractures remain open and nonoccluded by mineralization or the shale. Just on a probability basis because you have all these different sands failing and fracturing and then moving, there will

984

be a family of fractures that will be open allowing fluid to migrate in both the lateral and vertical sense.

Q There was quite a bit of discussion about the Kelly Bushing. Do these logs get corrected for Kelly Bushings? I mean, you know that -- you know what the height is when you have the actual log itself?

A Yes. And there's two issues here. You have your datum, you know what your datum is. And when you're making structural maps, you're subtracting that datum to reference everything subsea, or you're returning everything to sea level.

So, for example, if you're in Kansas where the ground level is in the 2,000-foot range, then it becomes very significant. If you're down in Oyster Bayou where I am, the ground level is 20 feet. So you need to know what your ground level is with the -- in addition to the Kelly Bushing to subtract that out to reference everything to subsea to make a correct structural map.

When you're trying to look at things stratigraphically where the -- you're hanging everything on a similar stratigraphic horizon -- for example, on the cross-section, I hung everything on top of the Cockfield so that you can line up the top of the Cockfield. So the Kelly Bushing or the ground level

985

doesn't make any difference because what you're doing is you're lining up -- and this is an interpretation, but you're lining up something that, say, is the Cockfield, top of Cockfield here, top of Cockfield here, and top of Cockfield here. So you're lining that up so you can compare the stratigraphy of the sands or shales below. It just makes it easier for your eye to jump across there.

It's very hard when you put the logs at their structural position to make those correlation to say, "This sand is this sand; this shale is this shale." So it's just -- they're just -- these are two common types of displays. One is a structural cross-section, one is a stratigraphic cross-section.

Q And the exhibit that I believe now has been marked as TexCom 102 that's a stratigraphic cross-section?

A That is.

Q And this issue about the Kelly Bushings doesn't have anything to do with the validity of what the purpose for which that particular exhibit was developed, does it?

A No, ma'am.

Q Okay. Turning to exhibit TexCom Exhibit 102, do you still have that in front of you?

986

A Yes, ma'am.

Q In the Wapiti 2315D, there was a lot of discussion about the pressure differences. And there was a difference in the -- I always refer to it as pressure gradient -- at different depths as it was measured in the Wapiti well. Can you explain why there is that difference?

A The difference has been demonstrated out through the history of the Conroe field by its production. And, for example, in those lower Cockfield sands we've been discussing at length, those guys were originally at the same original pressure, pretty close to that .4, 5, somewhere in that range. And they continued to draw down to a point wherein right before unitization, they were about 600 pounds. So the inference was that they weren't connected, that they were separate and apart.

And once they stopped producing and they started to gradually pressure up again, well, what you're seeing there is that the -- is that it's the effect of the tortuous path; in other words, the production is being -- the production that's producing the hydrocarbons and creating a voidage quicker than the aquifer can recharge it and repressure it up. So what you're seeing here is something -- a similar phenomena,

987

is that the production out of the upper Cockfield as you get higher -- closer to the top is a longer tortuous path, and the closer you are to the aquifer, the closer you are to that aquifer's pressure. So you're seeing that gradation. It's a reflection of the production producing quicker than the aquifer can repressure up the reservoir again.

Q So if I understood you correctly, it's lower pressure higher in the formation, because you're closer to the production -- or a lower pressure gradient because you're closer to the production, and a higher pressure gradient because you are closer to the source of replenishment of pressure?

A Correct. And that was -- if I may add one other thing, that was also seen early on in the production history by fault blocks. Some of the people were move aggressive in their production of the wells or actually got into a better sand and were able to produce their well quicker so that you could see that variation depending on the rate of withdrawal. So the weight of withdrawal is germane to this discussion. Given time, if you turn off the spigot, everything would reequilibrate.

Q I think -- is Oyster Bayou one of the fields you're working in? Is that also slated for enhanced oil

988

recovery CO2?
A Yes, ma'am.
Q And where is Denbury on its pipeline to bring this CO2 to Texas?
MR. RILEY: Objection. Beyond the scope of cross and certainly irrelevant.
MS. MENDOZA: Well, the scope of cross was the what has Denbury done to get ready to do CO2 to figure -- you know, on this whole issue, and bringing the CO2 to Texas is part of what have they done to get ready to bring CO2 into these fields, including the Conroe field. And I believe Mr. Riley opened the door.
MR. RILEY: I don't believe I asked those questions. The only problem is I didn't ask those questions. I asked about whether they had authorizations to construct wells to accomplish their CO2 plan. I didn't ask a single question about a pipeline. I asked a question about profitability and their commitment to continue and whether it would continue even if it were unprofitable. And I didn't ask any questions about their preparation of a pipeline to come to Conroe.
JUDGE WALSTON: You didn't ask that specific question, but I do think it opened the door to that, so I'll overrule the objection.

989

MS. MENDOZA: Thank you.
Q (BY MS. MENDOZA) Mr. Herber, I think the question on the table was, what has Denbury done in terms of its pipeline to bring CO2 to Texas?
A Denbury has built a pipeline from their Jackson -- excuse me -- from the endpoint of their Jackson dome production facilities where they produce actual CO2. This is one of the only known natural occurring sources of CO2 outside of the west Texas --
JUDGE WALSTON: Okay. Just answer the question, though. What have they done?
A Okay. They've put a pipeline to Oyster Bayou, and they're -- it's intending to extend it to Conroe and Hastings. The terminus is there and the -- and, as we speak right now, is at pretty close to 2,000 pounds.
Q (BY MS. MENDOZA) So in other words, CO2 has actually begun flowing into that pipeline?
A The pipeline is full and waiting for regulatory permits to start injection to Oyster Bayou.
Q And what you're waiting on at Oyster Bayou is a -- in part, is at least the unitization decision?
MR. RILEY: Objection. Now, we're talking about Oyster Bayou and what's going on there. Certainly seems broader than any questions I've asked.
JUDGE WALSTON: Yeah, I think that is

990

getting little farther afield, so I'll sustain that objection.
Q (BY MS. MENDOZA) Is part of being able to inject in a field in general, is part of that dependent upon having a unitized field for this kind of enhanced oil recovery operation?
A It is.
Q And in Conroe, we have a unitized field. Correct?
A That's a blessing.
Q And the answer is "yes." Correct?
A Yes.
Q You were asked questions about evidence of the highway, pathways, roads, or whatever that you have seen evidence of that would lead to the migration of the fluids, specifically, I believe, the wastes from the lower Cockfield. And I want to talk with you about what evidence you've seen of that.
Have you seen evidence that there are various pathways for the waste or the fluids to move out of the lower Cockfield and into other formations or the portions of the Cockfield?
A One of the lines of evidence is in that AAPG article, which I am so fond of referencing. They had a discussion about water production, that there were 59

991

some-odd wells that were producing water, and a large portion of those wells could be attributed to beyond the edge of the field so that when the water moved up, they started to water out. That's the hallmark of a water drive system.
In a pressure deplete system, it doesn't matter where you are. If you're on a downdip side -- excuse me -- on a down -- structurally downdip part or the upper dip part, the contact never moves because there's no aquifer support. So the contact never moves in a pressure deplete system; but in a water drive system where you have aquifer support, it moves up, and those wells on the edge water out.
But they were mystified -- and this was 1936, so three years after discovery of the field -- they were mystified why some interior wells were experiencing water production. And they correlated those -- nine of those wells to being proximal to the faults.
So the conclusion of the authors of that paper was that the water was coming from up the faults and causing these wells to have a high water cut. So that was the first line of evidence that the whole Cockfield is in a pressure support and that it's breathing as one.

992

The author made several comments about the fact that the common oil/water contact all the way across something that's almost 30 square miles was unique. The fact that when wells were drilled several years later that they seemed to be having the same pressures as the adjacent wells that were several years older, meaning that the whole thing was breathing as one. So there's lots of evidence in the early history of the field that the thing was connected.

The -- one of the other lines of evidence we talked about a little earlier is the pressure in the TexCom well, having them close to the same gradient as the pressure in the 23D well. There has never been any perforations in the lower Cockfield. There's been no known production. So the inference is that the reason that was depleted from something -- and we can argue about what original pressure was, but it was something significantly less. So it sort of says that the depletion in that TexCom well, and the fact that it's so similar to the 23D well, says that the lower Cockfield is in communication with the middle Cockfield, which is where that Wapiti pressure is.

So at the very top of the middle Cockfield, by TexCom's definition, we're roughly at the same pressure gradient, if you will. So the contention

993

is that they're breathing together, and the only way they can do that is with communication through faults or juxtaposition for the sands.

Q And, mr. Herber, I want to clear up one thing that you said. I just wanted to make sure about this. You said there had never been any perforations with the lower Cockfield. Did you mean to say no production from the lower Cockfield?

A No oil and gas production.

Q Okay.

A And TexCom hasn't produced that well either as far as -- and neither did Crossroads, the predecessor. They didn't produce any salt water. The only thing that's happened to that well has been several injection tests, injection fall-off tests, to my knowledge.

JUDGE WALSTON: Ms. Mendoza, are you close to a stopping point?

MS. MENDOZA: I probably have a little bit more to go. If we want to take a break for lunch, I'm fine with that.

JUDGE WALSTON: The court reporters need to swap out? They need to swap out. Why don't we go -- we'll just go ahead and take our lunch break. Can everybody be back by 1:00? That's a little less than a an hour.

994

MR. RILEY: That's fine. I think we even talked about 30 minutes last Friday, so I'm geared up for 30 minutes.

And I know this is hard on the court reporter, but if we only have five more minutes of testimony to finish versus 30 minutes, if we have five more minutes, I don't know if my good friend could hang in there, but...

MS. MENDOZA: It is possible we could go longer. So I'd like to -- if we can go on and take a break. I mean, I don't know how much longer we'll go.

MR. RILEY: My experience is that we'll take a break, and then we'll have definitely more than five minutes, but...

JUDGE WALSTON: We'll go ahead and take our break, and we'll come back at 12:45.

MR. RILEY: Can we go off the record on a few items, then?

JUDGE WALSTON: Yes. Yeah, we'll go off the record.

(Recess: 12:06 p.m. to 12:48 p.m.)

995

AFTERNOON SESSION

MONDAY, JUNE 21, 2010

(12:48 p.m.)

JUDGE WATSON: All right. We're back on the record in SOAH Docket 582-07-2673 and 2674.

Ms. Mendoza, you're on redirect?

MS. MENDOZA: Well, I did want to address one procedural matter. You had asked us about the Notice issue, and Denbury would like the opportunity to file a reply brief and if we could have until close of business tomorrow.

JUDGE EGAN: That's fine.

MS. MENDOZA: Okay.

JUDGE EGAN: Mr. Herber, I'll remind you you're still under oath.

WITNESS HERBER: Yes, Your Honor.

PRESENTATION ON BEHALF OF
DENBURY ONSHORE, LLC (CONTINUED)

JIM HERBER,

having been previously duly sworn, continued to testify as follows:

CROSS-EXAMINATION (CONTINUED)

BY MS. MENDOZA:

Q Mr. Herber, I think when we adjourned, we were talking about a line of questioning that you had

996

received on cross examination about the evidence of some highway or pathway and whether it could get there from here, I believe, was the quote that Mr. Riley had used. And I wanted to talk a little bit more about other pathways that you see for fluids to migrate out of the lower Cockfield and into the other parts of the Cockfield Formation.

Can you identify -- have you seen other pathways other than the fault as the potential for migration of fluids out of the lower Cockfield and into other portions of the Cockfield?

MR. RILEY: Objection. I'm 99 percent confident that where we're going next is Mr. Herber's testimony about evidence that should have been provided in discovery under the rules of disclosure for an expert witness.

We talked about it a little bit this morning about whether the -- counsel made some reference to we had an obligation to come to the judges to compel them to produce 3D seismic information. And I may be wrong, and I'm sure counsel will tell me if I am, but this is exactly where I think we're going.

And my reading of the 194 requirements is absolute; that an expert witness who's going to rely on any information must provide that information as part of

997

a disclosure. It's never been done in this case.

MS. MENDOZA: Well, I think there are a couple of places that this is going. One, I think it will lead to the seismic information, and perhaps when we get to that point, we will -- we can talk about that. There are some other, though, places that this is going.

MR. RILEY: If there's other places, then fine, but if we're going to go seismic, then I think we should talk about it now, but it's okay.

JUDGE EGAN: Well, when she gets there, we'll discuss it.

MR. RILEY: Thank you.

JUDGE EGAN: So go ahead. You can answer.

Q (BY MS. MENDOZA) Other than seismic at this moment, can you answer my question about other pathways?

A Yes. There's some evidence on the TexCom logs that there may be some small fractures in the lower Cockfield.

Q Can you point to what log you're referring to?

A This would be in TexCom Exhibit 11, page 121 of 270.

Q And this is --

MR. RILEY: Can we have a minute to get there? I'm sorry. I just need to get the exhibit out.

JUDGE EGAN: It's Exhibit 11, page 121?

998

A 121 out of 270.

MR. RILEY: I have it. Thank you.

Q (BY MS. MENDOZA) Mr. Herber, is this a log of -- a type of log of TexCom WDW410, formerly WDW315, well?

A Yes. It's a log that was run by Halliburton.

Q What kind of a log is it? Can you describe what kind of log it is and what kind of information we see on it?

A On the header of the log, which is the top part, it's called "Electric Micro Imager Run To," and it shows a scale.

And what this device is, this is a -- often a six-arm head device, and if you flip down just a little bit, you'll see a series of columns that look like they're running slightly diagonal to the page, these columns over here. So if you're looking at it with the -- at the top of your table, it would be the columns that are on the far right.

The column on the left is a gamma ray curve so you can sort of locate yourself in depth to the original open hole log. So that's merely a correlation curve.

Then there's some quality control curves that show where the spatial relationship of those

999

different pads are. When you log a well, there's a twist in the logging cable, and so as it comes up, the whole tool twists. So it's -- this is information that is the orientation of these different pads. And you can see by the -- each one these little columns represent those six pads.

On -- each of those pads has a bunch of little resistivity buttons, and what they're doing is measuring the microresistivity to create a resistivity image. And what -- in very loose layman's terms, it's the resistivity of the shales is conductive, and the sands are not as conductive. And so it gives you sort of like a electronic picture of the wellbore.

It's also a super dipmeter. So in that middle column, where you see those little tadpole-looking things and then the things that look like rose diagrams, that's showing you the dip of the bed that's calculated by this tool, and then the rose diagram shows you the -- shows you the cumulative orientation of those tadpoles.

Q And did you look through this well log to see if you saw fractures down in the lower Cockfield?

A Yes, I did.

Q And can you point us to what it is you've observed?

1000

A Okay. If you view the wellbore as a cylinder, like this can here, if you were to imagine that a fracture or a fault, for that matter, were to cut that at some angle, okay, so I have a plane like this cutting across it, if I were to make a cut on this cup and cut off the bottom and cut off the top and unravel it, you would see that this cut would create a sinusoid. Okay? So what you're doing when you're looking for faults or fractures on this presentation is looking for a sinusoid.

This copy is rather poor, but at the depth of roughly between 6300 and 6310, you see some marks that look sinusoid-like. They are different than the parallel bedding that you see above and below. I know it's just one possible fracture or fault. You have no idea of the throw.

What you do from this presentation, you get a dip from it. So the line company can look at that sinusoid and tell you the orientation of and dip of that. They can't tell you how much throw it on it. It can be anything as far as the amount of throw. It could just have no displacement and just be a fracture, or it could be a fault with some displacement.

JUDGE EGAN: Can you put a sticky or something on there to show what you're referring to?

1001

MS. MENDOZA: Your Honor, let's mark this as Denbury's Exhibit -- I think it's 22 or 23. Why don't we go with 23, to be safe?

JUDGE WATSON: Isn't it already in evidence?

MS. MENDOZA: That way, the one that he marks can actually be an exhibit in the record so that you-all will be able to see the record.

(Exhibit Denbury No. 23 marked)

Q (BY MS. MENDOZA) Mr. Herber, do you have a pen up there with you, by any chance?

A I don't have a pen.

Q Let me hand you one or get one for you.

Can you mark on what we'll mark in just a moment as Denbury Exhibit 23?

A Shall I just mark the range, Your Honor?

JUDGE EGAN: Yes, please.

A Okay. So I'll just put two vertical -- one vertical line and two bar -- just to make a bar and a line so you can see.

JUDGE EGAN: That's fine.

MR. RILEY: May I approach and see what the witness has marked?

JUDGE EGAN: Yes, you may.

MS. MENDOZA: We may have skipped 22 in

1002

the record. We'll just mark one this as 23, since we've talked about it. We may have missed 22 in the record.

Q (BY MS. MENDOZA) Mr. Herber, in terms of not being able to get there from here, in other words, getting out of the lower Cockfield into other portions of the Cockfield, did you take a look at 35-foot shale that was on top that's been claimed to be on top of the lower Cockfield?

A I did.

Q And what specifically did you look at to help you make your analysis?

A Let me find that shale here on the log here.

Q Can you tell us what log you're looking at so that everyone can start looking at it?

A Yes, ma'am. As referred to earlier today, it's Exhibit 11, page 120 out of 270.

JUDGE EGAN: Is that TexCom Exhibit 11?

A Yes, that's TexCom Exhibit 11. There's been a lot of discussion about the shale above the top of the lower Cockfield as being a potential barrier. And if you look at the SP curve on this, and that would be in tract 1. So if you hold the log like --

MS. MENDOZA: I think, if I can interrupt you, why don't we go on and mark this as Denbury Exhibit No. 24, and that way, you can mark these items on them

1003

when you talk about them and everybody will at least in the record copy be able to follow along.

MR. RILEY: I have a suggestion. Why don't we mark it Denbury Exhibit 22 so that we can fill in the gaps and not spend the next few years looking for 22.

MS. MENDOZA: That's a great idea. Thank you.

(Exhibit Denbury No. 22 marked)

Q (BY MS. MENDOZA) So that we're clear on the record, we're going to mark this exhibit that you have in front of you as Denbury Exhibit 22. And can you tell us what Denbury Exhibit 22 is?

A Can I just place it anywhere?

Q Put it down at the bottom where the TexCom mark is.

A Thank you.

Q Can you tell us what kind of log this is?

A This is what's commonly referred to in the industry as a triple combo. This is commonly what your first primary log is when you're logging your well. This is the logs you want to run first to determine what you have.

And the format is very standard, no matter what logging company you use. Usually tract 1 contains

1004

the gamma-ray and the SP curve. Those are the curves that tell you where your different -- the area where we're at, we're dealing with sands and shales mainly. We don't have limestones or dolomites, or they're very rare. So we're basically trying to determine where the impermeable zones are and where the permeable zones are in tract 1.

The next tract over, tract 2. So if I'm holding this thing like this, the -- tract 1 would be the furthest to the left, tract 2 would be the -- excuse me. There's a depth track, and then tract 2 would be the first one to the right of that, and then tract 3 would be the furthest to my right. Okay?

In tract 2, there's a resistivity curve. And there are three different resistivity devices that have different spacings. And just -- even in oilfield terms, they're called medium, deep, and shallow. And the deeper one has the larger spacing, and so it's looking further out and averaging a big chunk of rock. The smallest one has shorter spacing, and, therefore, it has the highest bed resolution, and looking at a smaller interval of rock.

In the third tract are two porosity devices: One's a neutron and one is a density. And they're reading porosity through different mechanisms.

1005

The neutron is basically -- in a very basic level, is looking at how much water is in the pore space. So the more water this tool sees, then the more porous it is.

The other one is using energized gamma-rays. And however much bounces back from the electron fields, it gives it a clue as to how dense the rock is. So that's why it's called a density tool.

Q Let's look first at, I think -- what is the tool that's more water, more porous, that you described? Let's talk about that one. I think that that's -- was that a resistivity?

A No.

Q I'm sorry.

A If you want to talk about the resistivity, you can see that they're in --

Q Can you mark on there perhaps with an "R" the resistivity lines?

A Okay. There. In fact --

Q Can you tell us how you marked those?

A What I did, I marked them slightly differently. I marked them all "R." The one that is deepest is "RD," the one that is intermediate is "RM," and the one that is shallow is "RS."

Q Okay. And did you notice anything in particular about those lines in the vicinity of the

1006

shale that is at the top of the -- what TexCom has called the lower Cockfield?

A Let me make sure that everybody knows where that interval is.

So if you were to look on this log, you'll see in the center tract there's a depth, you know, and you'll see roughly 6000. It's almost buried by a letter, BV -- BHV, and that is also right below AHV.

JUDGE WATSON: Are you looking at the thing in the middle, the depth?

A Yeah, that's the depth tract that has the depth determination.

JUDGE WATSON: So do I go down to 6000?

A Yes. Please do. And allow me to depart basically from my -- the attorneys because I want to show you where the shale is first.

MR. RILEY: And I don't mind, but, generally speaking, I would object.

Q (BY MS. MENDOZA) All right. Well, let's talk about -- explain to everyone where TexCom has set the top of the lower Cockfield. Can you tell me what -- is that at 6045?

A Yes, ma'am.

Q Okay. And so if I wanted to see the top of the lower Cockfield, I'd go to approximately 6045 on this

1007

chart, on that depth log?

A By their definition, it's a Q. That means to any geologist, it would be plus or minus a foot.

Q And so -- and then I think that we're talking about shales that may or may not be right on top of that. Is that correct?

A Well, the TexCom assertion is that shale is roughly 38 feet thick.

Q And what does the resistivity data that you see in Texcom's log tell you about that shale and its competence and whether it is really 35 to 38 feet thick?

A Okay. Why there are three resistivity devices is to try to get a handle on invasion. So when you drill your well, you have a mud, and if there is permeability or porosity in the straight-up and next to it, it will form a mud cake. And the filtrate will invade into the formation where it is permeable and porous.

And so if it is tight and permeable, those three tracts of resistivity should track each other or be very close; they will lay on top of each other. And when you have a departure between the medium and deep, that implies that you have permeability because you have invasion.

So if you look in the middle of the shale

1008

by Texcom's, you see an area that looks sort of like a crown. It's basically from 6014 to about 22. So 6014 to 22, you see a shallow reading device, which is the solid line, has got -- it's separated from the medium and -- which is the short dashed line, and the deep, which is the longer dashed line.

Q Does this tell you that what they've encountered in that particular area is more permeable and porous than what you would expect for a shale?

A That's correct.

Q Is there anything else in this layer right above the lower Cockfield about the resistivity logs? Are there other areas where you see more permeable and porous material than a shale?

A I'm not sure if I understand your question.

Q I was -- I didn't know whether you had pointed out for us the only areas in which you saw this sand based on the resistivity log.

A In that interval we're talking about, that's -- there's another little, small, thin, maybe 2 foot right near the very top. It would be -- give me a second. It would be roughly 11 to 13. It would be that little spike. You can see there's a separation there.

Q Can you -- on Denbury Exhibit 22, can you circle those two areas that you just talked about as

1009

being more permeable and porous than a shale and circle those?

And would you characterize those more as a sand?

A Well, by the fact that they're invaded by filtrate says they're not a shale. They could be thin silts, they could be fine-grain sands.

And the other thing is, you get the thin-bedded nature if you look at the shallow curve by how it's looking sort of spikey-looking.

MR. RILEY: May I approach when the time is right so I can see what the witness has marked on the exhibit?

JUDGE WATSON: Yes.

Q (BY MS. MENDOZA) Can -- you circled two things. Can you just write beside those perhaps, "not shale"?

A Can I just use arrows?

Q Yes. You can point to it if you need to if the space is too tight, so...

MR. RILEY: May I go up?

JUDGE EGAN: Yeah; if you'd like to take a look at it. Hold on just a second.

MR. RILEY: Thank you.

Q (BY MS. MENDOZA) I think one other line that

1010

you had talked about on that in your earlier answer to some of my questions, was you mentioned something about a gamma or a gamma neutron? I'm not sure I have the name right. Which one were you talking about?

A Counselor, that would be in tract 1.

Q And what's the name of that particular --

A Gamma ray.

And this tool is basically a Geiger counter, if you will, in a very simplistic way. And all it's doing is measuring the radioactivity of the rock.

And the basic premise here is, you're measuring uranium, thorium, or potassium. Those are the radioactive materials that the gamma ray is mainly seeing. And the dominant in nature material that you'd see on a gamma ray is potassium. Most of your clays -- not all of them, but most of your clays, see potassium. They're part their lattice structure.

So in a very loose sense, the industry uses gamma ray to determine how much is shale and how much is sand. And it's scaled so that it looks like it's the SP curve, which is your other shale/sand indicator.

Q Can you mark on Denbury Exhibit No. 22 the gamma curve? And why don't you mark it down there in the area of the lower Cockfield so that when we look at

1011

it, we're all in the same place.

A Actually, Halliburton has done a pretty good job of labeling it already. It's labeled --

Q Okay. Will you go on then and circle that so that it will call it to attention in the exhibit?

And looking at the gamma curve in the area immediately below -- above what TexCom has characterized as the lower Cockfield, does it tell you anything about whether there is shale or sand there?

A There are two little thin deflections on here that could be interpreted as either being sandy or silty, but definitely not shale.

Q Can you mark those for us? And right out beside those, perhaps, you can use some arrows that say "not shale"?

And can you tell us at approximately what depth those are?

A The first little peak would be at 6015. It almost gets to 20, not quite. The next little peak is roughly 40 to 42 or 43.

Q And then I think you had perhaps mentioned some sort of caliper or some other line on there that had some same information about sands and shales?

A Yes, ma'am.

Q Can you point out which line it is you're

1012

talking about?
A It is in tract 3, and it would be called a differential caliper, to be more complete.
And, actually, I notice, Counselor, that the resistivity curves are also marked by Halliburton in this area that we're looking at.
Q Can you circle where Halliburton labels the differential caliper curve?
A I did.
Q Okay. Can you tell us what it is that the differential caliper curve is measuring, what that tool was does when it goes into the hole?
A For efficiency's sake, what is going on here is the density pad, to be efficient, has to be up against the borehole. It's on a pad device, a little swing-arm device. So it presses that detector and transmitter right up against the borehole wall. And it's a spring-loaded arm, and it measures the borehole size.
And the reason that's important is for several reasons: One, if the hole is washed out, it means that some of your logs have some calibration or may not be perfect. But the most important reason is to calculate your cement volume. So you want to know the actual hole size versus the original bit size.
I believe this well was a 9 7/8 hole, and

1013

so what you want to do is -- to get a good cement job, you need to know that volume of the hole. And if you know the size production pipe you're running, you subtract that borehole volume from -- and you subtract your pipe, and then you get an annular volume so you can calculate how much cement you need to properly cement this well.
But the other part of this deal is, it shows how washed out that hole is. And commonly what happens, the competent rock, i.e., the sands, are not washed out, and the incompetent lithologies, i.e., the shale, are washed out.
You can see on this where -- the area where it's white on the differential caliper is more washed out, and the areas where the proposed sand was by resistivity is not as washed out. So there's some correlation between where the resistivity device shows there to be pure shale and where the resistivity device shows there to be some sandier or silkier area. So there's basically some porosity -- some equivalent type data that's saying that this is probably true.
Q Can -- in the area immediately above where TexCom has designated as the top of the lower Cockfield, does the differential caliper tell you something about whether there is sand there or shale there?

1014

A It basically says there's a little bit of larger grain material there. So why is this important? We've learned from --
MR. RILEY: Objection. Again, I know we're trying to get the testimony covered, but the witness now is elaborating on questions and going off in directions that he thinks appropriate.
JUDGE EGAN: Could you please do question and answer? Just answer her question, Mr. Herber.
Q (BY MS. MENDOZA) Can you identify where in the area immediately above the lower Cockfield, by depth, you are seeing some of this larger grain material that you say is not shale?
A It would be those intervals that I circled on the gamma-ray and the resistivity device.
Q Can you also mark how -- where on the differential caliper you are seeing areas that you believe not to be not shale.
A I'm sorry. I've already -- I made a mistake in ink. I circled the stuff that was shale.
Q On which one?
A On a differential caliper.
Q Okay. Why don't you put an "X" on that circle. And now why don't you circle the parts on Denbury Exhibit Number 22 on the differential caliper log that

1015

are not shale. And if you can label each one of those circles as "not shale."
Do those three lines pretty much line up where you've seen "not shale" is consistent across the different tools, roughly?
A The one small little resistivity peak has just a slight deflection, and that would be highly -- it would be an interpretation to say that that's not shale.
But the larger resistivity area definitely is not washed out as much as the hole -- either side of that, suggesting that it's more competent and therefore interpreted to be more sandy.
Q Okay. And so as a general matter, after looking at this layer that's immediately on top of the lower Cockfield, does this information indicate to you that what we really have on top of lower Cockfield is alternating thin beds of sand, silt, and shale?
A That's my interpretation.
Q And do you believe that to be the -- to be the case in this instance?
A Yes. And I've seen this phenomena in --
MR. RILEY: Objection again. Now we're going to talk about something else. He said "yes." He answered the question.
JUDGE EGAN: Mr. Herber, just answer the

1016

question.
A I'm sorry.
Q (BY MS. MENDOZA) Based on your experience in seeing these types of thin beds of sand, silt, and shale, is this going to be a very ductal material or is it going to be a very brittle material; in other words, does it break easily?
A It should break easier than, say, the Jackson shale.
Q And have you seen similar things to this in geologic formations where one might see on part of the log it looks like a shale, but in reality it is actually alternating thin beds of sand, silt, and shale?
A I have.
Q And have you seen that from sampling that was done within the Conroe field?
A I have.
Q Can you explain to us what kind of sampling you've seen that was done within the Conroe field that shows that something that might appear to be a shale on a log would turn out to be alternating thin beds of sand, silt, and shale?
A In the Exxon 227 -- excuse me, 2720 well -- let me restate that to be -- so everybody is perfectly clear.

1017

In the Exxon 2720 well, they took a core on that well, and they also logged it. And there was a shale in that well by SP that looked to be shaley.
Q And I'm going to interrupt for just a minute. You said "by SP." Did you mean by the log --
A By the log.
Q -- it looked to be shaley?
A Yes.
Q Okay. Now go on and continue. I just wanted to make sure everybody knew what SP was.
MR. RILEY: I'm sorry. Just so I'm plodding along, the shale looked to be shaley? Is that what I understand the testimony to be is that --
Q (BY MS. MENDOZA) I'm sorry. The log would indicate a shale.
A The log would look just like we're looking at TexCom. SP curve would look like a shale.
Q And, in reality, when the core was then run, what was found?
A What the core showed was alternating thin beds of sand and silt and shale. Most of the -- it was equivalent thickness, roughly, of 30 feet; and the average thickness of the different layers was inches. Some of them, maximum may be a foot or so, but variable thicknesses.

1018

Q And then going back to the initial question that started this whole line, which is the can-you-get-there-from-here question about things moving out of the lower Cockfield, do you have other indications that there are pathways for materials to move out of the lower Cockfield and into the other layers of the Cockfield?
MR. RILEY: I want to object to -- prematurely that are we now moving into seismic, and counsel indicated that we would talk about it when we got there.
MS. MENDOZA: Yes. I believe we're going to move into seismic.
JUDGE EGAN: Let's go ahead and deal with the objection.
MR. RILEY: The objection I have is that under Texas Rules of Procedure 194 as pertains to documents or information relied upon by experts, the requirement to produce that information is absolute. No exception, particularly if a witness is going to offer testimony directly about the information he relies upon to -- the witness is obligated to provide to counsel, counsel is obligated to provide it to other parties, and that was not done in this case. Setting up some notion that it's then the -- another parties' responsibility to

1019

protect the information that is -- that Counsel's obligated to produce is contrary to the rules, contrary to the rules of discovery.
In addition, in this matter there is an protective order. So to the extent -- counsel suggested earlier that we should have moved to produce this information under some other rule, rules of production, we certainly asked for the information. The protective order was entered, and we've used it several times as pertains to counsel's information.
So my application at this point is to preclude this testimony.
MS. MENDOZA: Well, first I do want to address the issue of the protective order. The protective order that was entered with regard to Denbury in this case addressed two very specific pieces of information that were requested by TexCom.
It addressed -- and I'm pulling up my protective order -- Denbury's land -- I'm sorry, three pieces of information.
Denbury's land files, Denbury's well files, and a particular presentation. There was a management presentation that involved financial information. And that was specifically what this protective order addressed.

1020

So I don't think that this information was the subject of that particular protective order.

And when TexCom inquired about this information, we specifically responded to them that this protective order didn't do it, and we could not simply turn it over under a protective order, we needed to be ordered to turn it over under the terms of our license agreement. They have been aware of this information.

And the rule is that, you know, the burden to secure a hearing to resolve a discovery dispute is on the parties seeking discovery. They were well aware of this information. I made Mr. Riley personally aware of it during a deposition. I e-mailed with one of his counsel of record during this case.

And for us to assume that we needed to come to Your Honors and start a discovery dispute when they are the requesting party and the burden is upon them, if we are -- to follow up on this, they may -- my only assumption is on some level is that perhaps they didn't want to see it. I would have thought, after Mr. Riley asked about it in a deposition, he knew that this information existed, and he did not pursue this, that they had determined that it was not something that they were going to look at.

MR. RILEY: Let me add some facts to what

1021

Ms. Mendoza has mistakenly reported to you.

First is, we're not seeking this information under the request for production. It is her obligation under the rules of disclosure to provide the information; and it's absolute, as I mentioned earlier.

To access this information, what we were told is we needed to go to Denbury's offices and sit at a computer terminal to review the information. That's the discovery dispute. We chose not do that. It didn't seem fruitful to us, and particularly since the witness did not reference -- or vaguely referenced the material, and it could have been applied to other seismic information in his prefiled testimony.

The reason we are here and even discussing this is, I believe it was Mr. Walker attempted to raise the question about seismic information, which to that point there was no reason for us to pursue it. It wasn't relied upon, as best we knew, it was -- except that counsel wants to represent now that it was relied on by this witness for his prefiled testimony. That's certainly different from the story we've heard this morning.

But regardless, we're not under the rules of production. We're under the rules of disclosure. And when an expert witness relies upon information, the

1022

requirement to turn it over is absolute, even if it is privileged information. Even if it was attorney-client privileged information, attorney-client privilege is waived under in those circumstances. There simply is no reason for us to have pursued it.

Now, Ms. Mendoza may have chosen -- it certainly is a mechanism that she's tried earlier to protect information. And she could have explained this to the Court if she were trying to meet her obligations, which is not the case here. There's a protective order in place. She could have said this information needed to be covered by the protective order and she needed to be ordered to produce it to meet her obligations. That's not what happened.

MS. MENDOZA: Your Honor, TexCom has had the opportunity to depose this witness. He elicited information about this witness reviewing seismic in that deposition. We specifically disclosed that "Mr. Herber has reviewed seismic data licensed to Denbury. Denbury is prohibited from providing the seismic data to third parties by the terms of his license agreement without a court order and a protective order."

We specifically -- specifically -- disclosed this.

JUDGE EGAN: Is this in the deposition

1023

you're reading from?

MS. MENDOZA: No. I'm reading from my disclosure. "Mr. Herber has reviewed seismic data licensed to Denbury. Denbury is prohibited from providing the seismic data to third parties by the terms of his license agreement without a court order and a protective order."

We specifically disclosed that to them. There was no question what seismic data was in issue here. We offered to confer with Mr. Riley's associate, and we received no response to that offer.

MR. RILEY: That's not true.

MS. MENDOZA: Mrs. Winningham did not respond to my e-mail in which I said, "I would like" -- "I'm available by phone to discuss this issue. Here is my cell phone number."

MR. RILEY: Counsel likes to shift the burdens. In this case she's tried it a number of times.

The reality is, if we look at 194, it refers to the obligation for expert witness disclosures, which my colleague is turning the page on. And 194.2(f)(4)(A) regarding what counsel is obligated to do, it says, "Disclose all documents, tangible things, reports, models, or data and compilations that have been provided to, reviewed by, or prepared by or for the

1024

expert in anticipation of the expert's testimony." There's no qualification to that.

In fact, I think if we really wanted to digest these rules a little further, we can't obtain that information -- we're supposed to obtain it through the 194 disclosures. I think requests for production, actually getting at the expert witnesses, the basis for their opinion, is precluded under the production, but -- I'm sorry, I'm little bit out on a limb on that one.

But the long and short of it is that there's no qualification inherent. There's a requirement to disclose all information relied upon. Counsel didn't meet that requirement. It can't shift to us because of a licensure agreement. She could have sought protection, sought the order that she's saying she needs to -- whomever she needs to give it to, but the reality is she didn't do what she's supposed to do under 194.

MS. MENDOZA: Your Honor, the burden of securing hearing to resolve the discovery dispute is on the party seeking the discovery. That's the case law. It's McKinney versus National Union Fire Insurance Company, 772 S.W.2d 72, Texas Supreme Court, 1989.

MR. RILEY: For a protective order, though, there's a different requirement.

1025

JUDGE EGAN: Give me the cite again.

MS. MENDOZA: I'm sorry. It's 772 S.W.2d 72.

They're asking that if we were to tell you -- if we were to tell them that something were available, whether they wanted it or not, we needed to come to the court and get the court to rule upon it, when perhaps a party does not want it. They were well aware that this data existed. Our disclosure is absolutely clear.

JUDGE EGAN: Do you have that disclosure with you?

MS. MENDOZA: I have an excerpt from the disclosure. I can get the disclosure here shortly.

MR. RILEY: One -- another burden shift issue. If we look at the actual wording of the rules, Rules of Civil Procedure 192.6(a), "The person from whom discovery is sought and any other person affected by the discovery request may move within the time permitted for response to the discovery request for" -- I'm sorry -- "within the time permitted for response to the discovery request for an order protecting that person from the discovery sought."

It was Ms. Mendoza's obligation, not the applicant's, to seek a protective order. She didn't do

1026

it in this case; even though she'd like you to believe it's our obligation.

JUDGE EGAN: Okay. We're going to go ahead and take a short break. 10 minutes, 15.

JUDGE WATSON: We'll just make it 15, and it will be our first afternoon break.

JUDGE EGAN: Okay. Come back at 5 till 2:00.

(Recess: 1:35 p.m. to 2:00 p.m.)

JUDGE EGAN: We're back on the record. We've taken a look at the rule and what the parties disclosed to us happened and how it happened. We're going to overrule objection.

You may proceed.

MR. RILEY: Judges, I'm sorry, but I need to understand a little bit better, if you can help me. What is it that happened that allows under the rules for this to proceed?

JUDGE EGAN: In our opinion, there was adequate disclosure.

MR. RILEY: Okay. I'm sorry. I don't mean to belabor the point. Adequate disclosure so that the burden shifted for us to seek a protective order? Is that where we are?

JUDGE EGAN: I'm not going to argue with

1027

you about it. We've made our ruling, and we're basing it on what was represented to us by both counsel and review of the rules.

Q (BY MS. MENDOZA) Mr. Herber, you were about to -- we were getting into a further discussion of "can you get there from here," and I believe you were going to talk about some other evidence specifically or other information specifically, some seismic information that you have reviewed and what that shows to you in the area of WDW410.

Can you explain to me when you've looked at seismic data what you see with respect to faulting or fracturing in the area of WDW410?

A The -- the 3D was a rectangular set of data shot by Ballard Exploration, in attempt to image the Wilcox level. It has a series of -- the dataset I looked at was in an amplitude display. To a non-geophysicist, that doesn't mean anything, but it's-- basically it's a preliminary process that allows you to make a preliminary interpretation.

There is another display called a coherency display, and it's a licensed or -- I don't know what you'd call it -- it's a trademark of -- it belonged to Amoco. They developed it there. And basically it looks at discontinuities. It tries to

1028

image discontinuities.

So looking at both those different datasets, I saw something that looked like a linear feature about 2000 feet north of the TexCom well. That would be basically parallel to the acknowledged 4400-foot sand. And that was the sand -- or that was the fault that we talked about in my deposition. And that was seen on the coherency data.

In addition, I looked at just the amplitude data. The dataset -- because it was shot for a deeper horizon to Wilcox, it had a high wavelength. That wavelength was roughly 500 feet. As a rule of thumb, you can see one quarter of the wavelength. That's your resolution of the dataset. So that means you can see faults that are roughly 100 feet -- excuse me -- 150 feet in thickness. So basically, without the coherency processing or something -- some additional processing, you can only see faults.

The key to interpreting faults is to see a series of breaks in a series of parallel lines. The seismic data, when it's displayed in a variable density format, looks like a bunch of parallel lines; and what you see is a break in displacement in those parallel lines. If there were no faults, you would just have a series of parallel lines, i.e., layer cake. So,

1029

therefore, the faults that I interpreted could be probably interpreted by almost anybody in this room.

And I found an additional fault inside the area of review. That would be in the TexCom circle of review. They have two faults on there: The one that we all agreed on, the 4400-foot fault; and then there's another fault that's right on the edge, it looks zigzaggy on the TexCom structure map.

And on the seismic data, I found another fault that would be in between. That fault would be an up to the coast fault. It would be --

JUDGE WATSON: A what?

A Up-to-the-coast fault.

Your Honor, let me backtrack little bit.

In the industry, there's a common -- I don't know what you call it, slang, when we talk about faults, there's down-the-coast and up-the-coast faults.

Down-the-coast faults are the ones that are usually normal. They have a 45-degree dip. If you don't know anything about them -- and they usually would be the -- the "down-from" side would be closer to the Gulf of Mexico, and the "up-from" would be further from the Gulf of Mexico.

Up-the-coast faults in the Gulf Coast area where we're doing geology would have the up-thrown side

1030

close to the Gulf of Mexico, and the down-thrown side closer to like -- to the north in this case.

This andesitic fault is -- intersects the 4400-foot fault roughly in the -- at the -- somewhere in the lower Cockfield.

The only reason I'm bringing these up is just that, you know, the discussion of the log with a little fracture in it in -- you know, these two additional faults just points out to the identification of some more possible faults and fractures. If you look at faults and fractures in this area here, because we're in a salt basin --

JUDGE EGAN: Okay. We need to go back to the question and answer, please.

Q (BY MS. MENDOZA) Yes. Okay. I want to talk about -- you've now talked about one additional -- you've talked about two additional faults, and I want to make sure that I have them outlined correctly.

You've talked about one fault 2000 feet to the north of TexCom WDW410 that runs roughly parallel to the 4400 fault. Is that correct?

A Correct.

Q And then you've talked about this other "up-to-the-coast fault," as you have called it, that is -- that intersects the 4400 fault. Can you tell --

1031

is it sort of perpendicular in a sense to the 4400 fault, if I'm looking at it from the top?

A No. It is also parallel.

Q Okay. And about how far is that one away from the TexCom well?

A Well, it's on the other side of the 4400-foot fault, so it would be from further away.

Q And did you see any other -- from the seismic data, did you see any other indication of faulting in the vicinity of the TexCom well?

A Not with that data that I -- you know, just below the resolution.

Q Did you see from mapping strata in that area or mapping horizons of the rock in that area or the topography, did you see any other indications?

MR. RILEY: Objection. Now we're talking about mapping. Is he talking about the same 3D seismic that we've been discussing, or did he do some additional mapping that has not been disclosed?

JUDGE EGAN: Clarify.

MS. MENDOZA: I'm sorry. I will clarify that.

Q (BY MS. MENDOZA) From the seismic data, did you generate some -- I call them sort of topographic type maps, or did you look at topography or the shaping

1032

of depositional environment?
MR. RILEY: Objection.
JUDGE EGAN: Go ahead.
MR. RILEY: If I'm understanding now, there's some additional information that this witness may have generated, would certainly not fall under licensure restrictions, that counsel is now trying to elicit testimony about.
MS. MENDOZA: I'm sorry. I thought I'd asked about seismic. If I wasn't clear -- I mean, this is an analysis of the seismic, so maybe I --
MR. RILEY: Still, it would be additional work done --
JUDGE WATSON: I think the question was "have you prepared some maps."
MS. MENDOZA: Oh, I'm sorry. Then I mis-spoke.
Q (BY MS. MENDOZA) Did you do any other additional analysis of the seismic that would show you any indication of faulting or fracturing in the area of WDW410?
MR. RILEY: Objection. Unless he's doing it from memory, he must have prepared something. Is he going to testify from memory, or has he actually produced documents, made notes, or done something that

1033

has not been disclosed?
JUDGE EGAN: And I don't know the answers. Did he prepare something that he is relying on, or is this an analysis simply by looking at the seismic data?
MS. MENDOZA: It's a -- I believe it is using the seismic data and printing something out, which is similarly protected by the license. We can't share -- it is the seismic data. It's just put down on a piece of paper.
MR. RILEY: Objection. That's not what we heard earlier.
JUDGE EGAN: I'm going to sustain the objection.
MS. MENDOZA: If I can just have a minute to go back through my notes.
(Brief pause)
Q (BY MS. MENDOZA) Mr. Herber, did you also look at -- in the line of "you can't get there from here" and whether that shale is allowing something to get there from here, did you look at other logs -- or other well logs from wells completed or that drilled at least as deep as the lower Cockfield?
A Yes.
Q Were there a lot of well logs that were drilled down into the lower Cockfield?

1034

A No.
Q About how many were you able to locate in the immediate vicinity of WDW410?
A Please define "immediate area."
Q Say, in the -- say, within a mile and a half.
A There would be only two or three.
Q Okay. Do you have an opinion from reviewing the -- however many well logs that you looked at for the WDW -- or I'm sorry.
Do you have an opinion from reviewing the well logs of wells that were drilled at least down into the lower Cockfield, whether that shale is laterally continuous across the field?
A I do.
Q And your opinion would be?
A If you -- if you go to the south, within that area, you'd find the shale would be continuous, but if you went to the north or to the east, you would see the shale start to thin. If you were going significantly farther to the east and/or north, there would be some wells that penetrated the lower Cockfield where that ground -- excuse me, the shale between the upper and middle Cockfield disappears. If you go to the south a little bit, you start to see the complexity of the faulting, and it's highly interpretative to what shale

1035

is what.
Q I want to make sure that we are talking about the shale in between the -- what TexCom has defined as the middle and the lower Cockfield. Correct?
A We're talking about that same 30-plus-feet shale that we've been talking about as far as log analysis.
JUDGE EGAN: So I make sure I understand, did you -- were there any wells west of this that you looked at?
A I did look at one well, but it's quite a distance away.
JUDGE EGAN: Okay. I just didn't know if I had missed something. Go ahead.
MS. MENDOZA: Your Honor, we pass the witness.
JUDGE EGAN: Okay. Questions, Mr. Hill?
MR. HILL: No questions, Your Honor.
JUDGE EGAN: Individual Protestants, Mr. Forsberg?
MR. FORSBERG: No questions, Your Honor.
JUDGE EGAN: Mr. Walker?
MR. WALKER: Yes, Your Honor. I do have a question or two. I'll try to be very brief.
MS. MENDOZA: Your Honor, I'm sorry. I'm

1036

hoping to get everybody's indulgence. I'd like to admit Denbury 22 and 23.

JUDGE EGAN: Any objections to Denbury 22 and 23?

MS. GOSS: Your Honor, with the understanding that counsel and I had a discussion earlier that she intends to provide copies to the parties.

MS. MENDOZA: Yes. I will work with the court reporter to get copies of those made for everyone.

JUDGE EGAN: With that understanding, Denbury Exhibits 22 and 23 are admitted.

(Exhibits Denbury Nos. 22 and 23 admitted)

MR. WALKER: May I proceed, Your Honor?

JUDGE EGAN: Give me just a second. Yes.

MR. WALKER: Thank you, ma'am.

RECROSS-EXAMINATION

BY MR. WALKER:

Q Mr. Herber, do you understand from your review and your participation in this matter that pursuant to Texcom's application that they have a -- part of their process, if you will, if not obligation, is a requirement to estimate and/or predict the spread or prospective spread of a waste plume once the waste is injected underground?

1037

A That's -- that not my area of expertise, but that's what I understand.

Q All right. Would Denbury's injection operations of CO2 under their enhanced well recovery operations affect potentially the spread of that waste plume?

MR. RILEY: Objection. Two reasons: One, he said he's not an expert, it's outside of his expertise to make any prediction about waste plume. And then secondly, as I recall earlier that it was out of his knowledge of what Denbury's plans were.

JUDGE EGAN: Sustained.

Q (BY MR. WALKER) Mr. Herber, I was trying to cut to the chase, but I will back up just a little bit.

Based on your knowledge of geology, based on your knowledge of the Conroe field and its geological formations and characteristics, what effect will the CO2 injection have on those formations, if any?

A My basic opinion on that is that the faults and fractures that are vertically transmissive and laterally transmissive for the plume is the same avenues and roads and streets that the CO2 would go down and help transmit the pressure from our CO2 injection the same direction, downward.

Q All right.

1038

A Remember that we both agree that the Jackson shale will keep both the effluent and our CO2 below it.

Q All right. Here's what I'm trying to get at is, if you don't inject CO2, then you have a situation -- subterranean situation that is unaffected by CO2 injection. Would you agree with that?

A Would you restate the question again, sir?

Q If in your enhanced oil recovery operations you do not inject CO2, you don't add that factor, you don't add that process, then whatever's in the ground is going to be unaffected by that. Would you agree with that?

A If we don't put CO2 in, it will no longer be an enhanced well recovery project. It will just be a production project we have right now.

Q Right. And anything that's -- any waste that's been injected into the ground would be unaffected by the absence of the CO2 injection. Would you agree?

A No; because we're currently producing -- we're creating a pressure sink, and that pressure sink draws the -- whatever you pump in it at the lower Cockfield up to the upper Cockfield.

Q All right. Does the CO2 injection process change that any?

A It changes it because we would be -- if you remember on that -- on the 2315 well, how you saw the

1039

pressures getting smaller and smaller as you went up. We would fill up that pressure sink by filling up the top of the Conroe Cockfield field with CO2 trying to get back to original pressure. So we would -- there would no longer be a pressure sink for the effluent. There would be minor pressure sinks on the producing wells once we started producing it.

To put my comments in context, I can only refer back to Oyster Bayou. Oyster Bayou is 5 square miles compared to the 30 square files Conroe is. We're going to have to inject in the neighborhood of 150 PCF over a year's time to fill it up to the point what we hope to get to happen in Conroe. So it will take a long time and a lot amount of -- a large amount of CO2 before it reached that point where it's -- the reservoir is repressurized.

I don't -- I'm not part of that team that are making those calculations and determinations.

Q All right. Thank you, sir.

MR. WALKER: Your Honor, could I have just a moment?

JUDGE EGAN: Yes.

(Brief pause)

MR. WALKER: Your Honor, I'll pass the witness.

1040

JUDGE EGAN: On behalf of the public interest?

MR. HUMPHREY: No questions.

JUDGE EGAN: Thank you.

TexCom, do you have any more?

MR. RILEY: Just a few questions. Actually it's probably more than a few, but...

RECROSS-EXAMINATION

BY MR. RILEY:

Q Let's go to -- I guess it's Denbury Exhibit 23, which is the Halliburton Electric Micro Imager Run To Scale 1 to 120 MD.

A Did you say 22 or 23, Counselor?

Q 23.

JUDGE WATSON: Which one was that?

MR. RILEY: It's right at the top. It's an identifier, but I just want to make sure we're -- the numbers got kind of jumbled a little bit. So I think it's Denbury Exhibit 23, which as I recall, we skipped a number and went back for 22. But 23 is the well log -- I'm sorry, it's not a well log. Whatever it is. It's a Micro Imager Run To.

A It is a well log, Counselor.

Q (BY MR. RILEY) Would you agree with me that at the time, as far as you know, as far as I know, and I'm

1041

betting as far as anybody else knows in this room, that there was no controversy surrounding the well such that the reviewer of the well log might be considered objective?

A Can you restate that question, please?

Q Sure. Let's pretend -- or take it as a hypothetical that there was someone who analyzed this well log on behalf of Halliburton.

A That's common practice.

Q And, in fact, in this case it seems that would be a guy named Paul Elliot. Would you agree with me?

A That's what it says on the log header. You're correct, Counselor.

Q Okay. So Mr. Elliot, whomever he might be, is not a witness in this case, looks like he was tasked with analyzing the well log data. Would you agree?

A Yes, sir.

Q And it looks like he made some observations about faults or fractures. Would you agree?

A Yes. There's a list there.

Q Okay. And it looks like -- when you get down, it looks like he made an observation of 4180, 4488, 4530, 4855, and then if I'm reading this correctly, 6510?

A Those are exactly what I've have on my exhibit

1042

here.

Q And his notation seemed to be that there was a possible fault or fracture at those depths. Would you agree?

A I agree.

Q So he does not appear to have found the fault or fracture that you described you found in the well log. Is that correct?

A That is also correct, Counselor.

Q Is the fracture that you say exists -- or is identified in the -- in your well log analysis, is that a mineralized fracture or is it open?

A From the quality of this print, it's impossible to tell.

Q But it could be mineralized. Is that correct?

A As could all these other ones on the list.

Q So just the fact that there's a fracture doesn't mean it's even a street -- right? -- in the context of our metaphor for streets, alleys, walkways, then on the other side, highways, superhighways, king freeway, and I don't think there's anything bigger than that.

A Yes, sir; but this list also opens up the door for other fractures.

Q It does, but it would really mean that they are

1043

either below or well above the injection interval?

A Let me take a second to look at that.

Q Sure. Take your time.

A That's correct.

Q Now, I don't think anybody intended to trick you, but in the later part of the redirect, we started referring again to the 35-foot layer as the shale layer. But I thought your testimony was it's not a shale.

What is your testimony regarding the 35 feet or so that you discussed at length with Ms. Mendoza?

JUDGE EGAN: Are you talking about the area between the lower and middle Cockfield?

MR. RILEY: Yes, Your Honor.

A It is my opinion, based on the log, that we're looking at an interval that is alternating sands, silts, and shale.

JUDGE EGAN: Is there a word for that?

A It's interbedded sands, silts, and shales is the common way to describe it. And the other adjective you'd like to use is thin-bedded.

Q (BY MR. RILEY) Could a 1-foot shale protect -- or create an impermeable -- could a 1-foot shale layer create an impermeable barrier in the context of our discussion?

1044

A No, sir.
Q Could a 2-foot shale layer?
A Would you like me to explain, or you want a yes-or-no question answered?
Q I'd like "yes" or "no," and if I feel like we should probably talk about it some more, let's do that. Let's just move quickly, if we can.
A Okay. The answer is no.
Q There's some number which I hope we'll agree that there is a depth of shale that would create a protective barrier, at least in the vicinity where the shale exists. Is that right?
A In this context, we're dealing with -- there's a spectrum of shales. As we talked about earlier, there's marine shales and there's continental or proximal shales.
JUDGE EGAN: Or what?
A Proximal.
JUDGE EGAN: Okay.
A The marine shales are deeper -- usually deposited in deeper water, and the proximal shales are the ones that are deposited closer to the shore. The examples of the proximal shales would be interdistributary bays, lagoonal. So if you're analoging them on the model, it would be like Galveston

1045

Bay, East Bay, West Bay, that sort of thing. Or when you look at the Rio Grande, the muds that would be in between the fluvial system.
There are a lot of situations where this would occur. Those shales commonly have little sands and silts in them because of the depositional environment, and they're usually related to either flooding events or storm events. For example, Laguna Madre would be a lagoonal mud, and when a hurricane comes in, the hurricane washes sand back into the lagoon. That's how you get sand in there. Or in a fluvial system, when the river floods, it breaches the levee and pumps a little bit of sand out into that area that is usually muddy. So that's how you get this deposition of sands and mud.
JUDGE EGAN: I think you're going a little far afield of his question. I think he asked at what depth or how thick would shale have to be, whether -- and you can explain how thick for marine and how thick for something else.
A I'm trying to get there, Your Honor.
JUDGE EGAN: Okay.
Q (BY MR. RILEY) Let's move it along. The Jackson shale is a marine shale. Correct?
A Yes, sir.

1046

Q Meaning that at some point in time, years, quite a bit of time, that -- in history, that area was deep underwater. Correct?
A Correct.
Q "Deep underwater," I'm going to go with 500 feet. Is that fair?
A Let's just leave it at "deep underwater."
Q Okay. So we can't fix a depth. Is that correct?
A It's -- sea level changes in a systematic manner, so if the Cockfield was shallow water, then it has the gradation of change. So the Jackson was deposited at sea level, rose, so some of the water depth in the Jackson is -- starts at the shallow end, and as the sea level gradually rises through Jackson time, it gets deeper and deeper. At some point where you have the best, most plastic, and most impenetrable is the deeper water.
Q Now, can -- speaking about the Jackson shale, can we agree that that's an impermeable layer in the context of our discussion; that it is -- barring some artificial penetration, that it is a sealing feature from the Cockfield?
A Yes, sir.
And let me add one little thing. From

1047

looking at capillary entry pressure, a marine shale, one who's distal, would have a capillary intra-pressure of around 8000 pounds. That sort of shale, in your previous question, 1 or 2 foot of that could be sealant.
And what I was trying to get to is that continental shales, the proximal shales with the thin beds of sand and silt are brittle, and the capillary intra-pressure in those type of shales are about a thousand pounds. So they don't have the same sealing ability, in addition to being -- with the sand and silt in there being brittle and subject to stresses of fracturing and faulting.
Q I think I understand now.
Do you have from your -- either your work and some of the other well borers and your review of the information, do you know that -- is it capillary pressure?
A That's correct.
Q And do you know that capillary pressure in the -- what we've called the 35-foot shale area, which I take it you don't agree it's all shale, but you know the capillary pressure in that layer between the middle -- excuse me -- between the lower and middle Cockfield in the WDW410?
A We don't have a specific measurement. We're

1048

using analog data here when we make that assertion.
Q Could it be 8000 pounds?
A Not likely, due to the depositional environment.
Q But could it be?
A No, sir I don't think so, in my opinion.
Q What would the range be, then, in your opinion in terms of capillary pressure in whatever shale layers there might be in that area? And by "that area," I'm talking about WDW410, middle and lower Cockfield.
A Let me share with you, Counselor, I took a class in seal anayl -- seal and pole analysis from Chevron just a little while ago. And --
Q I took a class in discovery, and apparently, I missed some portion of it, but I'd like --
JUDGE EGAN: No side bar comments, Mr. Riley. You know better.
MR. RILEY: I'm sorry, Judge.
Q. (BY MR. RILEY) But I'm trying to focus you on my question. I'm not trying to be flippant. I really do want to get to the answer.
Do you know the capillary pressure, without much of a story if we can avoid that?
A I was actually going to be rather brief.
Q Okay.

1049

A Okay? And the presenters there from Chevron, who were experts in the question of sealing ability of faults in shales, presented us with a basic concept of a spectrum of shales with the proximal shales being the one end of the thousand pounds and the distal being at 8000 pounds. Those are round, rough numbers.
If we erred and said it was -- instead of a class 1 at the very end of the proximal, you might gain maybe 2000 pounds of increased pressure, but that wouldn't have the same sealing ability of what the Jackson is. So our error bar is plus or minus a thousand pounds.
Q Do you agree generally that the middle Cockfield Formation has greater permeability than the lower Cockfield Formation?
A Could you restate that? I did not hear you.
Q You've probably heard folks discussing permeability in this case in a variety of ways, but there are various estimates of permeability in the lower Cockfield in the vicinity of the WDW410. Have you heard that testimony?
A I have.
Q And I think the high at this point is 190.6 and the lower, to my recollection, is 48.68 millidarcies. Does that sound right?

1050

A That range sounds correct, Counselor.
Q As pertains to the middle Cockfield, do you have an opinion as to the permeability of the middle Cockfield, even in relative terms, the numbers I just gave you?
A I do have an opinion due to analysis of the WDW315.
Q Would it be higher or lower than the numbers I gave you; the middle Cockfield in the well area that we've been discussing?
A It would be -- I would have to look at my analysis to give you that answer. Could I look at that?
Q Sure; if you have it handy. I want to move kind of quickly, if we can.
MS. MENDOZA: And just so everyone knows, these are the documents that were e-mailed around, I believe, last night in disclosures.
MR. RILEY: And just to note, they were at 11:35.
MS. MENDOZA: Yes. As soon as we got them, we went back to the office and produced them.
JUDGE EGAN: All right. I believe it's clear on the record that everybody has been working long and hard hours.
MR. RILEY: Yes, ma'am. I apologize if

1051

I've been inappropriate as a result of --
JUDGE EGAN: That's okay.
A Your Honor and Mr. Riley, the middle Cockfield would be just slightly better.
JUDGE EGAN: Slightly more permeable?
A Slightly. And there is in that -- in many core they develop a permeability porosity transform, where they plot all the data of permeability and porosity that they measure from the core. When you take that statistical line that you draw through there -- and we've had a discussion about it, similarly as the TexCom well, where you take all the data, and you want -- from that dataset, you want the terrible rocks with the best rocks, so you have that statistical grouping so you can draw a line. That's what allows you to make a believable judgment of what the middle Cockfield is, because we don't have any core data there.
But the porosity in the lower Cockfield -- on an average, the effective average porosity in the lower Cockfield in the intervals that are defined by TexCom is 21 percent. In the middle Cockfield, it's 22 percent -- excuse me, 22.8. If you want round it up to 23, so...
Q (BY MR. RILEY) And that's porosity numbers?
A Yes, sir. So you would go into that porosity

1052

permeability cross-plot to figure out what your average permeability would be. And so -- because if the porosity is slightly bigger, then your permeability should be slightly bigger.

Q So then the middle Cockfield is not likely to convey material -- by the way, we're talking about horizontal permeability in this context?

A Yes, sir, we are.

Q So the middle Cockfield, then, in the area of WDW410 isn't much better in permeability than the lower Cockfield. Is that your testimony?

A That's correct.

Q So then it also would prevent -- well, do you have an opinion on vertical permeability for the middle Cockfield in the area of the well?

A I've always maintained -- or always had the opinion that we have a series of vertical faults and fractures because of the salt tech time (phonetic), and they would go through the lower Cockfield up into the middle Cockfield and make it to the upper Cockfield, creating that tortuous path we've --

Q And I've seen other geologists testify, in particular in landfill cases, of this interconnection of fractures, particularly around the surface. And it looks a bit like a ladder. There's a fracture, you go

1053

little bit to the south, and then you look for one that's vertical, and you go up towards the surface, and so on. Is that what you're talking about?

A Yeah. That's why I used the words "tortuous path."

Q I know you don't interpret fallout test data, but do you understand that there's no indication in terms of the testing that been done on WWD-410 of those pathways?

A Remember, Counselor, that the fallout test is -- depends on the length of time and how far it sees it out.

Q There's some debate on that, but do you understand that at least all the experts who are qualified to interpret fallout test data have said fallout test data gave some investigation radius, a radius of investigation?

A Yes, sir.

Q You were here for testimony when there was some disagreement as to whether it reached 2568, according to the TexCom experts, or I think, in Mr. Grant's opinion, about half that, about 1400 feet.

A I heard Mr. Casey's testimony about that. I think I missed Mr. Grant's.

Q All right. If Mr. Grant had an opinion that

1054

the radius of investigation was about half of what Mr. Casey said, but that he saw no anomalies in that radius of investigation, do you think that's helpful in the context of our discussion on whether there's one of these pathways you've been describing?

A It would be.

Q So if I'm right, Mr. Grant said that he didn't see any of these pathways at a distance of 1400 feet from the wellbore based on the September 2009 fallout test, then this fracture pattern that you're concerned about doesn't exist. Is that right?

A No. I can't make that leap of faith, Counselor.

Q But there's no evidence of it either way in that context. Is that right?

A Often in -- as geologists, we're often estimating inferences or interpretations.

Q Right. And that's what Mr. Grant is trained in also is geology. He has the additional benefit of being able to read a fallout tests, and he said that he didn't find in anomalies or barriers, as I recall his testimony, in that radius of investigation. Do you remember the part?

A I do.

Q So at least as I see it, perhaps maybe others,

1055

there is no evidence of this series of -- or network of faults and fractures in that radius based on the fallout test. Is that right?

A Like I said before, I'm not an expert on fallout tests. I don't know what a fallout test sees. It usually sees a change in transmissibility. I don't know how big the fault or fracture has to be to affect the fallout test. It's averaging a lot of volume of rock.

Q Well, do you see any endangerment in this case to USDW from the TexCom injection? Talking about the Jackson shale. Seems like that's a defining layer. Do you see any endangerment to the USDW based on your review of information and testimony about the geology in this area?

MS. MENDOZA: Objection. I don't think that Mr. Herber has been qualified as an expert in the area of what is or is not a USDW, and so I'm not sure he actually knows where the USDW --

JUDGE EGAN: You want to lay the foundation to see if he has the requisite knowledge?

MR. RILEY: Certainly, Your Honor.

Q (BY MR. RILEY) Do you know what a USDW is, Mr. Herber?

A I do.

1056

Q All right. That tucks that away, then.
Do you know what a USDW is in the context of this application?
A I have a beginner's understanding. And at this particular edge, it's roughly at the base of the Vicksburg or -- what was it, 4400-foot, roughly.
JUDGE WATSON: Mr. Herber, if you can keep your voice up. You're trailing off. I know it's getting late in the afternoon.
A I'm sorry, Your Honor.
It's roughly at -- the top of the Jackson is the base of the USDW here.
Q (BY MR. RILEY) And that's -- as you mentioned, it's the top of Jackson above the thousand foot or so shale area that we discussed a moment ago. Correct?
A That's correct.
Q Now, as pertains to injection activity by TexCom, do you see any endangerment to the USDWs above the Jackson formation?
A I do.
Q And is that because of the potential for Denbury to produce wastewater, as you see it -- others, I'm sure, will tell us all about it -- to produce that wastewater and then it has -- it presents endangerment to USDWs?

1057

A Is that a yes-or-no question, sir?
Q I'm asking you if that's -- you know, I don't know.
But what I'm trying to ask you is, do you see that endangerment, the endangerment you just mentioned, you couldn't agree with me that there was no endangerment. Right?
A That's right.
Q Is that because of the potential for Denbury to produce wastewaters that are injected by TexCom and somehow those would find their way into the USDW?
A That's my opinion, yes, sir.
Q Except for that phenomena, which we will get into just a moment, the waste placement into the Cockfield Formation, barring some other force, would be appropriate disposal of waste. Is that your opinion?
A My opinion is that there's a thousand foot bounding shale below the Cockfield and a thousand foot bounding shale above the Cockfield. The waste injected in the lower part of the Cockfield could end up anywhere within the Cockfield.
Q But if not -- I'm sorry. Go ahead.
A If it weren't for Denbury's proposed operations and continued operations of the oil field, then it would be a perfect site.

1058

Q The operations of Denbury as they presently exist are simply -- can we call that conventional production, or is it more than that?
A As a geologist, that's my understanding. We're just producing the wells as are.
Q We talked a little bit about a pressure sink. Someone did. I don't remember who it is, but I think I did, maybe. There was some notion of a pressure sink being created by Denbury's current operations?
A That's correct, Counselor.
Q And I had you look at an example or an exhibit early in the day, which I believe is TexCom Exhibit 102. Do you still have that up there?
A I do.
Q In TexCom Exhibit 102, I'm following the story along, as it pertains to 2315-D, that well.
A Let me open it up so I can follow along.
Q Sure. Have you had a chance to look at it?
A Yes, sir.
Q What I note, and I think we discussed this at some length this morning, that that's -- that was -- at the time these pressure readings were taken, that was a new well; in other words, just drilled, fresh out-of-the-box well. Correct?
A Yes, sir. That's the only way those pressures

1059

can be taken.
Q So there was no production influence from that well at the time those pressure readings were taken?
A Well, the adjacent wells affected those pressures.
Q I'm sorry. I meant from the well itself. I apologize.
The well hadn't produced, so it's not as though that well was causing any change in pressure in the reservoir. Is that true?
A That well was closed by the offset wells. No production came out of this well when those pressures were taken.
Q So in that context, then, the first reading at the most shallow depth was a pressure sink. Correct?
A Correct.
Q And at the next depth was a pressure sink to any higher pressure. Correct?
A You're gradationally getting less -- excuse me. As you go downward, the pressure is increasing as it -- because you're getting closer to the aquifer support, and the pressure at the top is less because your tortuous path is longer.
Q It's a long, tortuous path. I mean, there's not instantaneous translation of pressure, even in the

1060

context of the pressure readings taken in the 2315-D. Correct?
A The equilibration here from Exxon's testimony when they tried to control the oil-gas context, it's years to get these things to equilibrate.
Q Could it be 30 years?
A No. Their testimony was three years.
Q And that was specific to certain aspects of what they were doing, not in general. Right?
A Well, that was the whole field, sir.
Q So is it your opinion, then, that the pressure evidenced by the Wapiti readings is in the process of equalization?
A If we turned off the whole field and stopped producing, it would start to re-equilibrate.
Q Do you know what the next most proximate well is to WDW -- excuse me, not WDW -- it's 2315-D? In terms of production well or any other type of well in the Conroe field, operated under the control of Denbury?
A No, sir, I do not. I could find that out if I looked at a map, but I don't know it off the top of my head, sir.
Q When you pressurized the reservoir, I think you told me -- or told us, rather, that Oyster Bayou is, I guess, proportionately a smaller reservoir that you are

1061

planning to pressurize. Correct?
A That's correct.
Q About 5 square miles?
A Yes, sir.
Q And that will take you -- that will cause you to put in 150 billion cubic feet of CO2?
A Roughly in that right order.
Q Is it proportional? Should I expect that the billions of cubic feet of CO2 that will be injected into the Conroe field would be about six times that, given the relative size of the surface?
A There is an age factor in there, so it's probably not a direct proportional because the thickness of pay at Oyster Bayou is tremendously thicker.
Q Oyster Bayou is much thicker?
A Yes.
Q And by -- I guess, hopefully, everybody's following along, hopefully, I am -- we're talking about the producing interval is much thicker at Oyster Bayou?
A It's thicker relative to the area. It's a --
Q Can you do that for us in feet? How big is the reservoir in feet in the Oyster Bayou?
MS. MENDOZA: I'm sorry. Are you asking about feet of depth -- depth of --
MR. RILEY: Yes. That's hopefully what I

1062

was trying -- thickness is what --
MS. MENDOZA: Thickness. Okay.
A Thickness of pay? Is that what we're asking, Counselor?
Q (BY MR. RILEY) I'm not sure what "thickness of pay" means, so why don't you tell me what that means so we can get on the same page.
A Okay. The area that we want to flood would be the area that has productive sand in it. And the thickness of pay is in the roughly 500- to 600-foot thickness.
The first sand, the A1 sand, is almost 200 foot of pure sand; it's the sand that had that kBkh of 1 to 1. It has tremendous perm and porosity. So it takes a larger amount to fill it up on a proportional basis.
But to get back to your original thing, just to keep things simple, we're geologists. We tend to round things up, so let's just take the area. It's going to be a much thinner and a larger amount of CO2 necessary to fill up Conroe.
Q Much larger amount of CO2 to fill up Conroe?
A Let's just say 4X or 5X. But what I was -- as a scientist, I tend to quibble over details. It's not 6X, but it's 4- to 5X.
Q And I like to quibble over details too, as a

1063

lawyer, so I certainly appreciate what you're saying.
The point I'm trying to understand is that you said earlier in response to somebody else's question they're trying to return the producing intervals in Conroe field to original pressure. Correct?
A That's the intent.
Q Given what I have learned in the course of this case and, hopefully, I'll forget soon, is the Conroe field is vast and the Cockfield Formation is even more vast. Is that right?
A The Conroe field is one of the largest producing fields in District 3 in Texas.
Q And it doesn't end at the unit boundary. It continues on beyond the unit boundary for many miles. Is that correct?
A Would you restate that question? I didn't hear you.
Q Conroe field and the Cockfield Formation is not -- it's not a small distance outside the unitized interval. The Cockfield Formation is even greater than the Conroe field area. Is that correct?
A No. The unit boundary contains all the productive area.
Q That's not my question. The Cockfield formation is what we've been talking about.

1064

A Okay.
Q You say it breathes as an aquifer. In out, in out. Right?
A Because it's in solitary.
Q Are there any boundaries to that in the Cockfield field Formation? Does it breathe in out, in out from the point at which we call it the Cockfield on one side to where we call it the Cockfield on the other side? Is there any limitation at all to this breathing that you've described?
A Geologically, I've seen usually when you go into the next large regional syncline, that seems to be the area where you go into another pressure regime. So if you were to look at the geo-map that was on -- as one of my exhibits, you'll see if you went further to the north several miles, you'd get away from the influence of the Conroe production and probably the same distance to the south and east and west. You would have to go -- it just depends on the structure to where you go into that syncline.
Q I guess what I'm trying to figure out is how much of the formation is breathing as one, the way you described it. Give me an aerial extent of the lung capacity of the Cockfield Formation and the area around WDW410.

1065

A It's in response to the voidage by the production that has come out of the field. And so what the aquifer is trying to do from both the lower Cockfield, middle Cockfield, and even further down dip in the upper Cockfield, it's trying to fill that voidage.
And so that -- it would probably be a calculation that somebody could make to calculate that voidage and then calculate how much the aquifer has to encroach to fill it up.
Q Well, okay.
JUDGE EGAN: We're running out of time. We're going to need to break soon. Are you almost at a stopping place.
MR. RILEY: Yeah. I actually could probably stop almost anywhere here. Just some cleanup items. So whatever's convenient to the rest of them.
JUDGE EGAN: We can break now, and we'll come back at --
JUDGE WATSON: 3:20.
JUDGE EGAN: We'll come back at 3:20. Okay.
MR. RILEY: Before we go off the record, I'd ask you to sign an order entitling us to the 3D seismic information. And we'd ask you to sign that so

1066

we can satisfy whatever licensure requirement we apparently overlooked last time.
MS. MENDOZA: If we can confer briefly about the logistics and -- I'd like to see how much of the depth of the seismic, but --
JUDGE WATSON: You-all figure it out, and get us an order.
JUDGE EGAN: We'll look at it, and we'll be glad to sign it.
(Recess: 2:55 p.m. to 3:28 p.m.)
JUDGE EGAN: We've been discussing settlement -- scheduling.
(Laughter)
MR. RILEY: We've kicked that around for a while.
JUDGE EGAN: I was looking at my settlement conference. It is -- we have been told Mr. Hill that if he was going long in his motion that he has before Judge Cloninger that we would adjourn today, and it looks like it is going to go long, so we will go ahead and adjourn.
We will reconvene at 8 a.m. tomorrow. And the parties have been advised that tomorrow afternoon, I will be leaving at 4:45. If no one has any objection to

1067

proceeding with Judge Watson for as long as you need to stay.
JUDGE WATSON: They may have an objection to that.
(Laughter)
JUDGE EGAN: And it looks like we may be convening again on Wednesday, and possibly on Thursday, so we will try to clear our dockets to see if we can accommodate that.
There was an also an exhibit we had asked for, a map of the area, that was representative of what the area looked like, and Mr. Forsberg has exchanged that exhibit with everyone and apparently there's no objection. Is that correct?
MR. RILEY: That's correct.
MR. FORSBERG: And I have physical copies for everyone as well. Did you want to make this as an exhibit?
JUDGE EGAN: Yes.
MR. FORSBERG: So, Your Honors, Individual Protestants, per your request, have a map that's a satellite image of the area from Google Maps, and also a street layout map. I guess we'll mark as Individual Protestant's Exhibit 29.
(Exhibit Individual Protestant No. 29

marked)
JUDGE EGAN: Being no objection to Individual Protestant's Exhibit 29, it is admitted.
And it has been delivered to all the parties. Is that correct?
(Exhibit Individual Protestant No. 29 admitted)
MR. FORSBERG: Yes, Your Honor. By individual e-mail and I will hand out copies.
JUDGE EGAN: Anything else before we adjourn? Okay. My understanding is you are going to work on a protective order regarding the seismic and, if possible, you'll bring it in computer form for Mr. Riley to review and his experts to review tomorrow.
MS. MENDOZA: Yes. Yes. We're working our best. I have informed him we've had some computer issues when we tried to load it. We are working diligently how to get it here.
JUDGE EGAN: All right. Do your best. Anything further from anyone?
MR. RILEY: No, ma'am. Thank you.
JUDGE EGAN: All right. We are adjourned for this evening.
(Proceedings recessed at 3:31 p.m.)

C

H

S